

# Contamination on the increase

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Spinners worldwide will note with some concern that contamination of cotton lint is on the increase as indicated by the publication of the 2003 Contamination Survey by the International Textile Manufacturers Federation (ITMF).

The continued and increased presence of foreign matter in raw cotton will be seen by spinners as yet another stumbling block to overcome if they are to survive. Certainly, the past few years have been very difficult for the spinning industry with numerous mills closing down and much restructuring taking place.

Contamination, even if it is a single foreign fibre, can lead to the downgrading of yarn, fabric or garments to second quality or even the total rejection of an entire batch. An ITMF study in 2001 reported that claims due to contamination amounted to between 1.4 and 3.2 per cent of total sales of cotton and blends.

This represents a significant cost to mills given the thin margins that cotton spinners survive on.

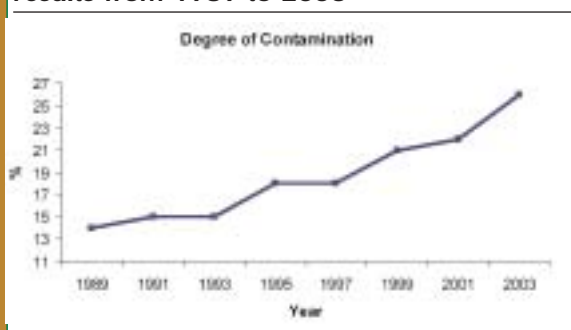
## THE ITMF CONTAMINATION SURVEY

In order to quantify and highlight the presence of contamination in cotton lint, the ITMF has been conducting cotton contamination surveys worldwide since 1989 on a biannual basis.

The 2003 survey reflects the perception of spinners regarding the incidence of contamination in cotton of various qualities. Spinners are asked to rate the degree of contamination in cotton lint according to 16 categories of foreign materials.

Stickiness in cotton and seed coat fragments are also surveyed (but not covered in this article). The 16 cate-

**FIGURE 1: ITMF contamination survey results from 1989 to 2003**



gories of foreign materials include:

- Fabrics made of woven plastic; plastic film; jute and hessian; and cotton.
- Strings made of woven plastic; plastic film; jute and hessian.
- Organic matter including leaves, feathers, paper and leather.
- Inorganic matter including sand and dust; rust; metal and wire.
- Oily substances/chemicals including grease and oil; rubber; stamp color; tar.

The degree of contamination varies widely from region to region. The most contaminated cotton continues to originate from India with almost 50 per cent of all cotton found to be contaminated (almost double the world average). India is followed by Turkey with 48 per cent, and more recently Central Asia, including countries such as Uzbekistan and Tajikistan, with 35 per cent.

In contrast, the least contaminated cotton originates from Zimbabwe with only eight per cent of all cotton found to be contaminated; the US and Australia with an average of 13 per cent; Israel with 14 per cent and more recently, some countries from West Africa.

Analysing the results of the surveys since 1989 shows that:

- The degree of contamination has steadily increased from 14 per cent in 1989 to 26 per cent in 2003. Figure 1 shows the steady increase in the degree of contamination since 1989.
- Eight per cent of all the cotton evaluated in 2003 was found to be seriously contaminated, with a further 18 per cent perceived as being moderately contaminated.
- Only 74 per cent of all cotton evaluated in 2003 was found to contain no or insignificant lev-



Examples of foreign material found in cotton bales delivered to spinning mills.

◁ 46...CONTAMINATION

els of contamination. This compares with 86 per cent in 1989.

- The degree of contamination has increased in 2003 in all 16 categories of contamination.

A further breakdown reveals that the major source of contamination continues to be organic matter such as leaves, feathers, paper and leather — which has steadily increased from 30 per cent in 1989 to 50 per cent in 2003 (increasing by 11 per cent since 2001). The next most prevalent contaminant is jute and hessian string, which increased from 22 per cent in 1989 to 38 per cent in 2003 (increasing by eight per cent since 2001).

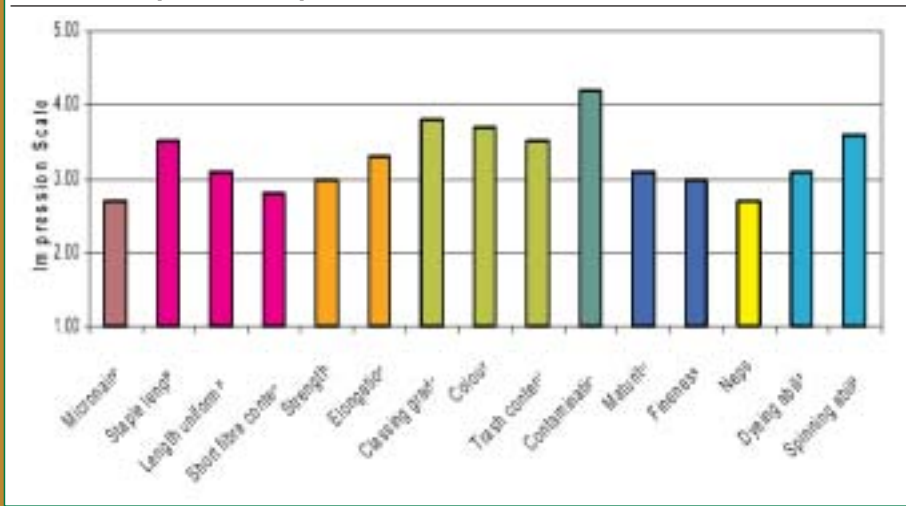
Of further concern is the fact that since 2001 there were also large increases in the incidence of inorganic matter such as sand and dust (up nine per cent), rust (up five per cent), metal wire (up three per cent) and also in fabrics (up four per cent overall). Mills in Asia have further also reported that there is a large increase in the incidence of human hair.

**Australian cotton**

Australian cotton is generally viewed worldwide as a quality fibre with low or no contamination and is usually purchased (at a premium) with the intention of producing high quality yarns, normally combed ring spun, for use in the weaving and knitting sector.

A recent survey conducted by CSIRO Textile and Fibre Technology of mills that use Australian cotton, indicated that although contamination has been rated as the one of the most favourable properties of Australian cotton, there are concerns that incidences of some contaminants are increasing. The results from this survey supports the results of the ITMF contamination survey which show that, as is the case world wide, contamination of Australian cotton is also on the increase.

**FIGURE 2: Spinners' impressions of Australian cotton**



A closer analysis of the Australian data shows that:

- The degree of contamination was well managed until 1999, increasing from five per cent in 1989 to eight per cent in 1999 — but thereafter rapidly increasing to 13 per cent in 2003.

Figure 3 shows the recent increase in the degree of contamination in Australian cotton.

- Three per cent of all the cotton evaluated in 2003 was found to be seriously contaminated and a further 10 per cent was moderately contaminated.

A further breakdown of the Australian data reveals that, as is the case world wide, the major source of contamination continues to be organic matter such as leaves, feathers, paper and leather, which has steadily increased from 10 per cent in 1989 to 36 per cent in 2003.

The next most damaging source of contamination in Australian cotton is string made from plastic film and more seriously, from jute and hessian. Contamination from jute and hessian string increased from 10 per cent in 1989 to 24 per cent in 2003 — the chief source being torn bale wrapping.

Increases in fabric made mainly from jute and hessian bale wrappings have also occurred during this period as has the incidences of woven plastic and plastic film — probably from module covers and module building oper-

◁ 48...CONTAMINATION

ations. Of further concern is the fact that there has been a steady increase in the incidence of inorganic matter such as sand, dust and rust, and increases in oily substances such as grease, oil, rubber and tar.

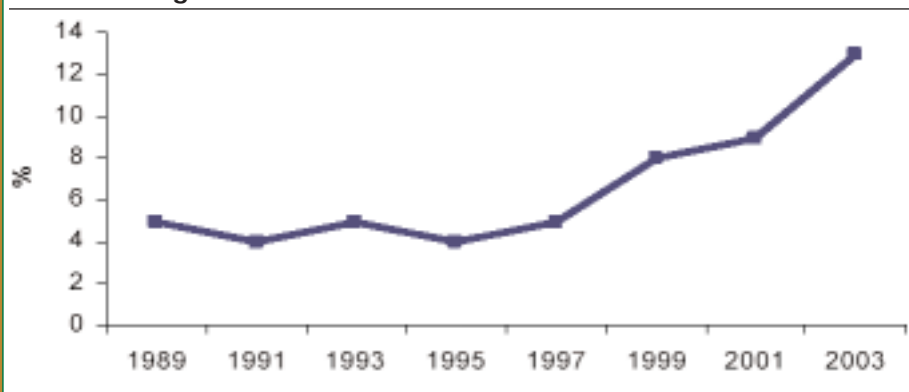
**METHODS USED BY SPINNERS TO COPE WITH CONTAMINATION**

In order to produce a cotton yarn of a certain quality, cotton passes through a large number of processes and so a large number of machines that mechanically reduce the size of most foreign matter that is introduced into the yarn formation process.

So contaminants introduced with the bale can remain undetected under normal mill processing conditions and only become noticeable when the production process is interrupted by a spinning end break or when the yarn is used to make up fabric and the fabric is subject to normal quality control inspection. So it is very important to detect and eliminate contamination as early in the process as possible.

The methods employed by spinners to detect and eliminate contamination are numerous and depend to a large extent on their location (developed or developing country) and origin of cotton used. The first step, and the most logical, is to avoid or minimise (which may not always be possible) the use of cotton from origins that are known to be contaminated.

**FIGURE 3: Degree of contamination of Australian cotton**



**Bale inspection department of a mill in Asia.**

Contamination survey results and the practical experience of mill staff are taken into consideration when purchasing cotton. Ideally, allowable levels of contamination should be stipulated in cotton contracts with ginning and merchant companies. Ginners and merchants could use existing ITMF survey information or be encouraged to develop their own contamination screening protocols to assess the contamination risk of their cotton.

Spinning mills situated in countries where labour costs are comparatively low have an advantage in this regard because they can employ large numbers of people to manually check and remove contamination from every bale of cotton before it is released for processing in the mill.

In these mills, people will also patrol the bale laydown and remove contamination from bales before cotton is fed into the blowroom line by the bale opener.

A mill in Asia that inspects every bale before processing reports that the amount of contamination present varies from five kg per 100 tons to 35 kg per 100 tons of raw cotton. If spinning mills are vertically integrated through to fabric production, the possibility further exists to remove contaminants manually from the fabric before it is dyed and finished.

But this is very time consuming and expensive. Furthermore, contaminants cannot be removed from knitted fabrics as this will cause holes and in

◀ 50... CONTAMINATION

woven fabric it is very difficult to remove contaminants in warp direction.

Chemical treatment such as bleaching/scouring in preparation for dyeing reduces the problem of contamination but adds further cost in processing and so is not acceptable to all customers.

Although manual intervention is helpful, even low labour cost spinning mills have come to realise that it is not always sufficient and are equipping their blowrooms with systems for detection, separation and measurement of foreign material.

These systems detect contaminants using acoustic, optical and colour sensors that monitor the material as it flows (is processed) through the machinery. When a sensor is activated by a contaminant it is measured (registered) and, depending upon the system, mechanically removed via an alternate material flow outlet.

These systems are normally installed at the beginning of the blowroom line before the final cleaning stage, although some spinning mills also install a second machine at the end of the blowroom line. The inclusion of metal detectors in blowrooms has been a standard feature for many years.

In addition to the systems located early in the yarn formation process (opening, cleaning and carding), most



**Blowroom equipped with Jossi detection systems.**

spinning mills have their winding machines and open end spinning machines fitted with yarn clearers to eliminate yarn faults present in the yarn. Most modern clearers have the capability to detect and remove foreign matter from the yarn before the yarn is delivered to the knitter or weaver.

All the methods and approaches discussed above reduce the risk of claims due to contamination, but there is no guarantee that the yarn produced will be 100 per cent free of foreign matter.

**CONCLUSION**

Cotton is continually under threat from man-made fibres. The reasons for this are numerous but there is no doubt that the continued and increasing presence of foreign matter in raw cotton is becoming a serious issue. This could seriously affect the whole cotton industry and force spinners to produce yarns with blends — or even more critically, produce yarns made from 100 per cent man-made fibres.

There is no doubt that the levels of contamination found in cotton can and must be controlled. The example set by Zimbabwe and Australia in the 1990s shows that contamination can be controlled. Contamination is not a fibre property but rather a product of the process which needs to be managed from the beginning of the cotton pipeline.

The industry cannot expect and force spinners to continually invest large amounts of money to satisfy quality needs and then be penalised for the presence of foreign matter in yarns, fabrics and garments.

Best management practices need to be drawn up and implemented by growers and ginnings world wide. Detection systems should also be incorporated in the ginning process to contain and reduce the incidence of contamination found in raw cotton.

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**Why spinners are hurting**

- The huge overcapacity of installed spindles around the world. This has had a huge impact on yarn prices with spinners currently obtaining prices equivalent to those achieved in 2000. Furthermore, the global textile market has become highly competitive and quality has become of paramount importance.

- The large amount of money invested to upgrade and modernise mills to reduce manufacturing costs and achieve the quality specifications demanded by customers. In 2002 alone, 3.6 million new ring spindles and 363,000 new rotors were installed worldwide, with further growth in compact and air jet spinning positions.

- Cotton purchases make up the largest portion of a spinning mill's operating costs. Cotton prices have risen sharply during 2003, with the Cotlook A Index approximately 50 per cent higher than the same period last year.

The recent price increase has had a major impact on spinners' profit margins and has also lead to shifts in production from 100 per cent cotton yarns to blends with man made fibres (most notably polyester) and/or production of yarns made from 100 per cent man made fibres.