	FEDERATION EUROPEENNE DE LA MANUTENTION **SECTION II** CONTINUOUS HANDLING	**FEM** **2 482**
	TEST METHOD TO DETERMINE THE CONTENT OF FINES AND STREAMERS IN PLASTIC PELLETS	Original E Edition E November 1999

This document has been drawn up Section II FEM in cooperation with the companies Neu Trans'Air, Waeschle GmbH and Zeppelin Schüttguttechnik GmbH.

1 - SCOPE

The scope of the present document is to determine and standardise a method of analysis of the quantity of fines, streamers (angel hair) or product degradation which may occur during the pneumatic conveying, blending, dosing, screening, storage etc. of plastic pellets and which causes problems during processing.

The aim of this standard is to establish an objective base of reference for the examination of these specific problems both from designers and final users point of view.

The analysis method this standard is based on has proved to reliably provide realistic information on dust content. If other special equipment for this purpose is used or developed, the manufacturer has to verify the accurate function according to this document.

2 - FOREWORD

During the pelletising process (extrusion and cutting) of plastics and the following steps of handling e.g. pneumatic conveying, blending, storage, dosing, screening, feeding and bagging, some degradation of plastic pellets may occur. This degradation may present three different main sizes: fines, streamers (sometimes defined as "angel hair") and miscuts or debris, whose dimensions and size are very different.

The degradation of the product mainly depends on the type of product grade. All plastics materials present miscuts and fines, while streamers are typical degradation of certain polymers, such as e.g. some polyethylene or polypropylene grades.

As all the above forms of degradation cause serious damage to the subsequent transformation of plastic pellets into the final product, most polymer manufacturers install pellet cleaning systems to improve the final product quality.

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The use of special conveying pipes with suitable internal treatment or low velocity pneumatic conveying systems can modify the type of degradation or considerably reduce the presence.

The test method described here is therefore an indispensable instrument to check the quality once the production cycle is terminated and to evaluate the performance of pellet cleaning systems or of the special pneumatic conveying systems. As the particle size and shape of the above mentioned degradation does cover the very large range from some micrometers (fines) up to several meters (streamers / angel hair), this standard will propose different analysing methods for the distinct size fractions (see next section).

3 - DEFINITION AND DESCRIPTION OF SEVERAL MECHANISM

3.1 Definition of fines

Fines content under the scope of the FEM 2482 is defined as the particle fraction with a particle size below 500 µm. The lower limit of this fraction is dependent on the needs of downstream processes and has to be chosen from the table below:

Type	Lower Limit	Upper Limit
A	63 µm	500 µm
B	45 µm	500 µm
C	20 µm	500 µm

As attrition of plastic pellets under pneumatic conveying also may lead to particles above 500µm, a second fraction has to be considered.

3.2 Definition of streamers

- The particle fraction with a size above 500 µm having a form deviating from the usual pellet shape is defined as streamers content (streamers, angel hair, film, foil).
- Undersized pellets, miscuts or broken pellets larger than 500 µm are not the subject of this analysis method.

3.3 Separation mechanisms

The scope of the analysis process presented herein is the total determination of all particles of dust and streamers fractions as defined above. The separation mechanism will be described in the passages below.

The streamers content for a particle size considerably larger than the pellet diameter can be determined by dry screening.

Due to high adhesive forces (van-der-Waals- / electrostatic- forces) between fines and pellets in the gaseous phase, separation of fines from the pellet surface becomes very difficult. However, in the liquid phase, these adhesive forces are a lot easier to overcome which makes a wet-process advantageous for this separation step.

The total process can be described by the following steps:
1 Reduction of the adhesive forces between the solids ;
2 Creation of an effective dispersion of the solids in the suspension ;
3 Separation of the fines from the pellets ;
4 Separation of the fines from the liquid.

- ad 1.: achieved by adding a liquid ;
- ad 2.: fluidisation by liquid stream (when liquid has a higher density than the test product) or flotation by injection of air ;
- ad 3.: performed by different Stokes - Velocities of the particles to be separated or by a sieve in the suspension stream ;
- ad 4.: performed by a filter, sieve or a sieve nest.

4 - SAMPLING

The fines content of plastic pellets might range under normal circumstances from 10 to 2000 ppm. For plastic pellets, reliable results can be achieved with a sample size of 1 litre or more.

Concerning the determination of degradation with emphasis on streamers (angel hair), the sample should have at least a size of 50 litre in order to minimise the influence of streamer nests.

However, special attention should be paid to this primary step of the analysis in order to ensure that no segregation procedures occur for dust content during filling, discharging and transport of a sample. With a pellet sample of a mass of 1 kg for example, fines masses between 10 mg and 2000 mg may result. With this small absolute mass to be determined, the influence of dust nests, dust agglomerates etc. is very large. Therefore the sampling can be viewed in different ways, depending on whether production variations or absolute values are determined. The methodology of sampling in these cases is very much dependent on the plant surroundings and can only be properly mastered with knowledge of the mechanical engineering process (see FEM 2 481).

5 - TEST EQUIPMENT FOR DETERMINATION OF FINES CONTENT

5.1 Brief description

The scope of the measuring device described here (see figure 1) is the separation of all dust from the pellets of the product sample to be tested. The apparatus runs with a washing liquid in recirculation mode.

The apparatus consists of
- a column C1 for dust-contaminated product,
- a column C2 for separating the dust from the washing-liquid,
- an overflow pipe connecting columns C1 and C2 at their tops,
- a pump with throttle valve and flow meter connecting C2 and C1 at their base.