

## **Trial plan - Allmineral Upflow Separator**

**Trial host/location:** Allmineral, Germany

**Trial date:** 20<sup>th</sup> March 2009

**Duration:** 1 Day

**Attendees:** Roger Morton

**Trial contact:** Andreas Horn, [horn@allmineral.com](mailto:horn@allmineral.com), Tel: +49 (0) 20 66-99 17-0, Ralf Orczewski, [orczewski@allmineral.com](mailto:orczewski@allmineral.com), Mobile: +49-172-2161933.

**Trial equipment:** Upflow separator

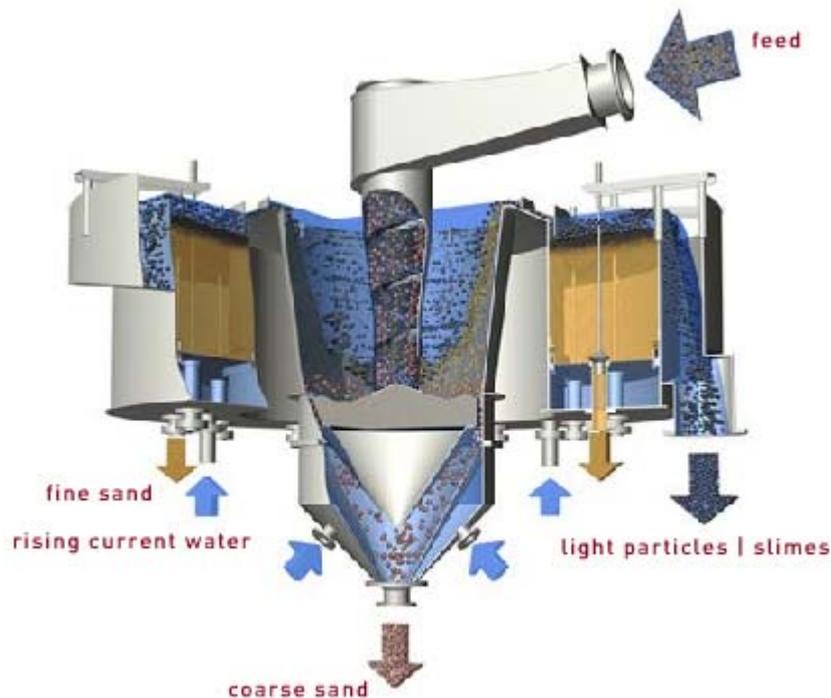
During the wet jigging trial for WRAP MDD018 the Allmineral Upflow separator (Allflux/Miniflux) was seen at the trial site and the idea to test this piece of equipment arose. There was not enough time during the previous trial to test the separator hence this further trial has been arranged. The photograph below is of the actual test rig at the trial facility.



Photograph of the upflow separator (Miniflux) taken during the wet jigging trial.

The full scale upflow separator is known as the Allflux whilst the version as the test facility is smaller and is known as the Miniflux. Both machines work on the same principle which is that of a fluidised bed created with water. The technique was developed for use in the sand, ore, heavy mineral sand and slag processing industries. It has not been trialled for use in plastic recycling previous to this. The unit can classify, separate, thicken and deslime all in one step meaning it is highly efficient and has a high capacity.

The Allflux can handle a wide range of in feed solids concentrations, a feed particle size of up to 4mm and a throughput rate of up to 2000 m<sup>3</sup>/hr. The Miniflux can also handle 4mm particles but has a throughput of only 300kg/hr.



The figure above is a cutaway schematic of the full scale system. The unit operates in a two step process. Material is fed into the centre of the system from above. An upward current is generated in the inner section of the system which is known as the coarse sand chamber. In this chamber the light fine particles rise whilst the coarse, heavy particles sink. The heavy fraction is removed from the central bottom part of the system. The remainder of the material over flows into the outer section of the system, known as the fine sand chamber. The second stage of the process occurs here where the fine particles form a fluidized bed. Light weight material, which has a lower specific gravity than the fluidized bed, floats and spills over a weir. The fine sand particles are discharged out of the bottom of the system. Therefore, the unit can produce three products. It is obviously unknown if the machine can be adapted to process material common to recycling such as metal/plastic/glass/wood mixtures.

The Miniflux is not a whole system: it is only a proportion of the cylindrical unit of an Allflux.

The upflow separator is similar in operation to the Delft University Kinetic Gravity Separator, tested in another trial for this WRAP MDD018 WEEE Separation Techniques project. Both the Delft University Kinetic Gravity Separator and the Allmineral upflow separator separate on the basis of differences in settling velocity. This means the separation exploits differences in combinations of shape, size and density.

The upflow separator has less moving parts than the kinetic gravity separator and may also have capacity advantages. However this may entail a less accurate separation.

**Trial objectives:**

The upflow separator has potential as an efficient technique for separating fine metals from plastic and glass derived from small WEEE. It may also be good for separating wet wood flakes from plastic granules where the density is similar but there are shape differences.

The objective of the trial is to test the upflow separator on a range of WEEE materials which have already passed through conventional density separations with the aim of separating:

- 1.) Fine wire from glass and heavy plastic; and
- 2.) Wood flakes from plastic granules in the density range 1-1.2.

**Sample material:**

The following material will be required for the trial:

- 1.) Copper/plastic mixture; and
- 2.) SwissRTec milled copper/plastic material.

For a trial on the Miniflux, a minimum of 300kg of each sample is required.

Small pre-trial samples of each of the materials will be sent to Andreas Horn at Allmineral for him to assess the suitability of them being processed in the Miniflux separator.

**Shipping address for pre-trial samples:**

FAO: Andreas Horn

Allmineral Aufbereitungstechnik GmbH & Co. KG

Baumstr.45

47198 Duisburg

Germany

**Sample shipping address:**

If a full trial goes ahead the trial samples should be sent to the following address.

Huemmler Maschinenbau

Att. Mr Johannes Hummler

Kalkwerkster 70

57413 Finnentrop-Fretter

Germany.

All samples must be clearly labelled with: **Allmineral project number 08.1.10251**

**Trial procedure:**

The following procedure will be followed for the trial.

Each of the materials will be tested in turn to see if a separation is achieved.

- 1.) The first aim of the trial will be to produce a highly pure copper fraction and leave a plastic/glass fraction. As the copper wire in this sample is very fine this separation should be possible. Visual analysis of the output fraction will initially assess if there has been any separation achieved.
- 2.) Samples will also be tested to see if the wood flakes can be removed.

**Samples/results to be collected during the trial:**

During the trial samples need to be taken of the product materials for the three proposed separations as shown in the table below.

Trial	Input material	Product 1 Weight and sample	Product 2 Weight and sample	Product 3 Weight and sample	System settings
(1) Granulated copper/plastic mix					
(2) SwissRTec milled material					

Any important settings for the machine should be noted during operation along with taking photographs of the equipment and material when possible and relevant.

Post trial analysis of the samples including hand sorting for the copper mixtures will be conducted at Axion's laboratory in Salford.

After the trial all the trial material should be returned to:

**Axion Polymers**

**Langley Road south**

**Salford**

**Manchester**

**M6 6HQ**

*Nicola Myles and Vincent O'Hora, Axion Recycling, March 2009*