

# Starting Waste Paper Recycling Projects in Urban Schools- British Council

## 1. Recycling waste paper

Use of waste paper is the easiest way of papermaking as all the difficult first stages have been done. There is no need for chemical digestion, bleaching and complex screening operations. The waste may only require re-pulping before being reformed as 'new' paper.

There are limitations to recycling that need to be considered. Paper can be recycled only 5 to 8 times before the fibers become too short and weak to be reused. It is therefore essential to use a high grade waste at the starting point. From both pulp quality and ink points of view, waste A4 paper is a very useful raw material for the recycler. Old newspapers are commonly used to make tissue and cardboard, while magazines are often recycled into newsprint. Waste paper will carry some form of printing which, if not removed, will cause the product to be discoloured. The process of removing the print, called de-inking, is often, not worthwhile for the small-scale operator, involving as it does, even more, expensive equipment. It is a better policy to concentrate on unprinted/partially-printed materials if these can be obtained. When the final product is used for making cards and wrapping papers it is sometimes acceptable to mask the discolouration due to ink by tinting the pulp to produce a coloured paper.

## 2. Paper making procedure - technical considerations

The process flow diagram below shows the sequence of a typical small scale waste paper recycling process.

### 1.1.Pulping process

Digestion is the process of removing lignin and other components of the wood from the cellulose fibres which will be used to make paper. With mechanical pulping the raw material is broken down into its individual fibres by grinding in a mechanical device. This step can be easily coupled with beating, if raw material originates from quality waste papers.

### 1.2.Beating

At this point, the individual cellulose fibers are still fairly hollow and stiff, so they must be broken down somewhat to help them stick to one another in the paper web. This is accomplished by "beating" the pulp in the beater. As shown in following picture, a small desk-top type blender/grinder can be used in small scale operations.



### 1.3. Forming

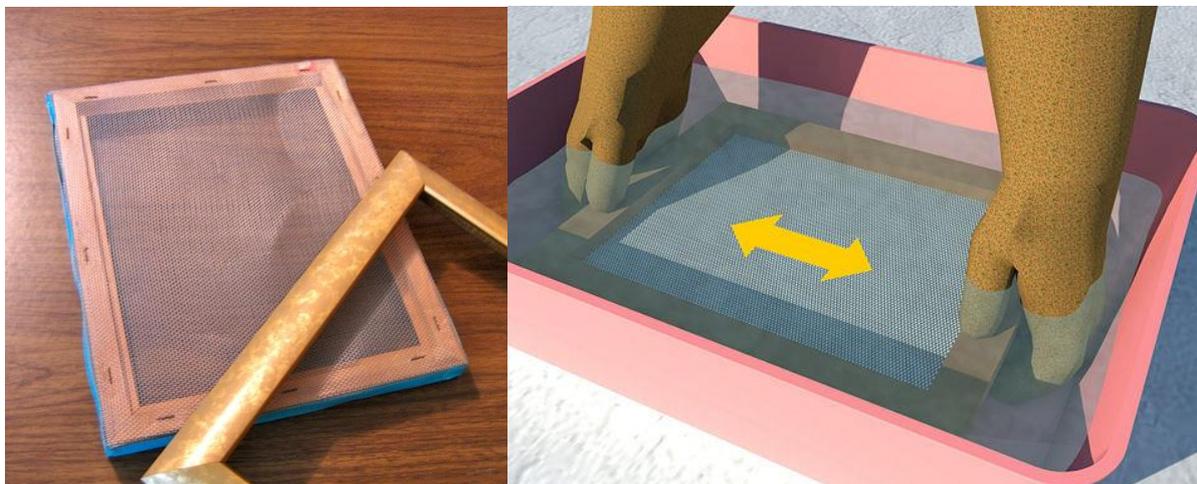
There are two methods of sheet formation:

#### Dipping method (for fine/thin paper)

The pulp is diluted with water and put into a plastic tray or vat. The lifting mould (mesh on a wooden frame) is then dipped into the trough, shaken evenly and lifted out with the pulp on it. The consistency of the pulp in the tank should be kept constant.

#### Lifting method

A fixed measure of the pulp is poured evenly onto a mould, which is clamped between two wooden deckles (frames) in a water tank and dipped. The mould is then raised to drain the excess water.



### 1.4. Pressing

The stack of handmade paper is usually squeezed in a screw press operated by hand-press. This is an essential step for making thick papers like cards and wrapping papers.



### 1.5.Drying

Once the paper has been formed, it has to be dried. In order to do this it must first be removed, undamaged, from the gauze.



### 1.6.Cutting

The sheets are neatly cut to the required size using a cutting machine. Effluent treatment and disposal is an important

## 3. Paper making equipment - technical considerations

Following table illustrates the list of equipments (detail BOQ) that required establishing a small scale waste paper recycling facility. In addition, the activity requires a water supply, electricity two tables and at least 10 m<sup>3</sup> of space under a roof.

No.	Item (description)	Units	Nos.	Unit price (Rs)	Amount (Rs)
1	Blender / Mixer Grinder	Item	1	6500.00	6500.00
2	Plastic trays (> 40 x 30 x 10 cm)	Item	2	600.00	1200.00
3	Plastic mesh (< 1mm grid size, ~ 1m <sup>2</sup> )	Item	1	400.00	400.00
4	Wooden frame ( 35 x 25 x 2, 1" timber flanks & fabrication cost)	Item	1	950.00	950.00
5	Mesh fabric (Cotton, 5 m <sup>2</sup> )	Item	1	600.00	600.00
6	Hanger clips & ropes	Item	1	400.00	400.00
8	Crew press (material & fabrication cost)	Item	1	15600.00	15600.00
9	Paper cutter and frame	Item	1	1200.00	1200.00
	<i>Sub-total</i>				<i>26850.00</i>
10	Miscellaneous (10%)				2685.00
	<b>Total cost of equipments</b>				<b>29535.00</b>

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