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OMAN

WASTE PAPER RECYCLING IN OMAN

Technical Report\*

by  
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Prepared for the Government of Oman by the Unido  
acting as executing agency for the  
United Nations Development Programme

Backstopping Officer: R. Mueller, Industrial Planning Branch

United Nations Industrial Development Organization  
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## Introduction

As requested in the job description - see Annex 1 - the expert examined the present waste and scrap paper situation in the country.

After visits to three waste paper collectors, to the government printing press and to the Packaging Comp. Ltd. (SAO) headquarters and after consulting and analysing the statistics in the 1990 Foreign Trade Statistics Book, issued by the Directorate General of Customs, the expert comes to the following scenarios:

**Pulp, Paper and Paper/Board converted products imported into this country in 1990**

33,861 tons with a value of 18,603,368 CR were imported into the country in 1990. The average value per ton amounted to approx. US \$ 1560.

5,673 tons of paper products were exported that year and this tonnage included waste paper of 4,621 tons.

Pulp/Paper/Board products remaining in the country amounted to 27,689 tons.

On this basis the consumption of paper products in this country is

13.8 kg/head/year

assuming the population is 2 million persons.

Here are the paper consumption figures for some neighbouring countries in kg/head/year:

Egypt	10.0
Emirates	49.5
Kuwait	7.8
Saudi Arabia	8.2
Iran	11.14
India	2.7
Iraq	0.7
Syria	1.0

Source: Pulp and Paper International, Annual Review 1992

## The Waste Paper Scenario

1990

Collected by 3 paper dealers

	tons per month	=	tons/annum
Newspapers, News Waste Magazines	40 + 60	=	1200
	20	=	240
Old Corrugated OCC	150 + 100 + 110 + 170	=	7,560
New Corrugated NCC	55	=	660
Office Waste	10 + 50 + 20	=	960
Printing Waste	20 + 30 + 15	=	780
Waxed Corrugated		=	60
	Grand Total		11,450

Recovery rate: 36% (on the basis of 32,310 tons/year)

There is always a certain percentage of paper which is non-recoverable such as toilet paper, hygenic papers, kitchen towels, handkerchiefs etc.

The total tonnage of such papers is about 4200 tons.

But there are two other sources which the expert feels have not been tapped yet:

Cement sack paper  
School books, Educational material

One other source of waste paper material of good fibre quality is:

Cement sack paper

The proportion of bagged cement production in the country is about 56% of the total production of about 1 million tons of two companies.

This means 11.2 million bags (50 kg) for 560,000 tons of cement.

With a weight of 0.15 kg per bag this represents a paper volume of 11.2 million  $\times$  0.15 kg = 1680 tons.

#### Educational paper material

One other source of waste paper (discarded exercise books, note books etc. comes from the educational field.

The rules (worldwide) are:

1 kg/head each year for pupils in general education

10 kg/head each year for students

The numbers of persons in education in 1991 were:

362,000 General Education

and

5000 Students

Their annual demand of

362 tons for books and exercise/note books in the field of general education

and

50 tons for books for academic studies should make about 412 tons of such material available each year.

### **Waste Paper Usage, Exports**

About 900 tons of newspaper (returns) are shredded and used in the country as animal bedding.

About 4621 tons (according to statistics) were exported via the port of Oman mostly to India. The price was US \$ 78 per ton.

The difference of 6,152 tons to 11,673 tons - see page 3 - must have left the country by truck to Dubai, because there are no statistics about it.

### **Why to Dubai?**

In Dubai now 3 months storage is free and there are no harbour charges, compared to 5% in Oman.

There is a Union Paper mill in Dubai (7 mio OR investment) which can produce up to 15,000 tons of corrugating medium and kraft liner papers on a 2.54m wide paper machine and such papers are used by the local packaging company in Sahar for example.



### Potential of the local scenario

So far, waste paper, scrap is collected from companies, stores, institutions, hotels, but there are no household collections. There are no drives to sort out paper in the households and no legislation yet to recycle different materials like glass, metals, aluminium cans, plastics, paper, cork, metal tins, as it is done in Germany, for instance.

It was said that 25% more waste paper could be collected if the municipalities would cooperate.

This could bring the total of waste paper that is collectible to a figure of about

16,000 tons  
which is a recovery rate of 50% (on the basis of 32,310 tons of paper).

And this recovery rate is very good!

### What to do with the Waste Paper

About 50% of the waste is OCC, (old corrugated cases). a good fibrous material to produce again the components of corrugated boxes: Kraft paper and corrugated medium.

Both types of papers are internationally produced on big paper machines up to 9 m wide, running at high speeds of up to 1000 m/min with production capacities of 300,000 - 500,000 tons/annum.

Prices vary but are very competitive.

Whether this very small paper mill in Dubai will survive over the next years - without protection - has to be seen.

Such a production of kraft liner and/or corrugated medium in this country is not recommended because such paper machines are very expensive and need 10 - 15l/kg paper water to operate.

Therefore, to export such OCC grades is very good for the country.

The other 50% of the waste paper are newspapers/magazines and office and printing waste.

There is already a market for old newspapers in the form of shredded animal bedding material in the royal stables. This market could be extended, if such material could be better baled and shipped to other places for animal bedding for sheep, goats, cattle and even chickens.

The soiled material is a good compost material and does deteriorate in the soil.

Such office waste material, shredded, can also be used for mulching - covering young seeds, and thereby suppressing weed growth.

It is also used as packaging material, replacing polystyrene chips, which are non-biodegradable and non-recyclable.

**Recommendations for more local use of waste papers**

Mixed waste	total amount available:
Waxed papers	about 2700 tons/
New Corrugated Waste	annum

There is no fibre mulching unit yet operating in the country. (Different fibre moulded products, see Annex 2.)

Egg trays used for packaging local eggs in two companies come from Dubai at present.

186 million eggs, packed in egg trays @ 30, 12x in a corrugated box need 165 tons of such fibre-moulded product.  
Packaged in 10 egg packs: 412 tons of fibre-moulded products are needed.

**Future need of the country for packaging eggs**

In the year 2000 there will be a requirement of 280 million eggs. Therefore, using egg trays @ 30, 537 tons of waste paper are needed for the production of these trays.

Packaged in packs of 10 each, the requirement of waste paper would be 1,341 tons.

In such a fibre moulding unit not only egg trays or egg packs can be produced, but by using different moulds a variety of fibre based products can be manufactured, see Annex 2.

The expert would like to draw attention to a recent development to replace plastic pots in gardening by waste paper/turf pots, which can also be treated with fertilizer and water slurping agents to facilitate the growing of plants under extreme conditions.

This should receive your country's special attention. More information is provided in the Annex 3.

### **Intermittent Single Cylinder Vat Solid Board Machine**

This board machine is not well known, but is still extensively used in Germany, China, India etc. For details see Annex 4.

A sheet is formed on the cylinder, couched on a felt and rolled up on a press roll, and the operator decides after how many revolutions of this roll the sheet is removed, and then dried and/or after treated.

A study report on the potential of such a machine was prepared by Mr. Glisby for Unido - after working with such a unit in the Sudan. See Unido publication.

A number of products - from waste paper- can be produced: bcgus board, solid board for hard packaging, thick board up to 2000g/m<sup>2</sup> for partition boards, display boards etc. The surface of the board can be improved by laminating with printed paper, textile cloth, plastic, etc.

The design of such a single vat board machine is shown in Annex 4.

The drying of the board can be done in hot countries in drying lofts.

The water consumption is minimal, (about 5 litres per kg), the investment costs are about one fifth of a Fourdrinier machine or a multi-cylinder vat board machine and the operation is simple.

The expert strongly recommends having a market study made to ascertain whether a production of about 2000 - 4000 t/annum of different solid boards can be absorbed in the country and exported to neighbouring countries.

Here mixed office waste together with OCC and/or NCC should be used as fibre material. For high quality boards, chemical pulp should be imported.

Technical details for such a machine are taken from Mr. Glisby's report, page 18, see Annex 5.

This Unido study should be updated.

Waste paper usage in the future

Newspaper	1900	animal bedding
OCC	7560	export
Magazines	240	animal bedding
Office waste	2000	fibre moulded product
Printed waste NCC	<b>3000</b>	
Waxed papers Office waste		
Printed waste NCC (imported pulp)	<b>2000-4000</b>	heavy boards solid board partition board

Bold figures are based on 25% extra future collections.

**Future Work**

In a second mission the expert recommends that more information be collected, analysed and brought to the attention of the authorities on the production of

    fibre moulded products  
and  
    intermittent board manufacture.

Under the guidance of the authorities, if so desired, first preliminary feasibility studies on such products and their production should be prepared, based on the observations and facts so far collected under the first mission.

### Acknowledgement

The expert would like to thank his counterpart, Mr. Zaki Al Busaid of the Directorate General of Industry, very much, who so efficiently organized in such short time the interviews with five companies. The expert would also like to thank the persons interviewed for their excellent cooperation, without which it would have been impossible to collect the information presented in this report.

He would also like to compliment Mr. Patricio Castro-Boisier, Unido Petrochemical Consultant under this project, on his excellent support throughout the mission.

#### Persons met in the Ministry of Commerce and Industry:

- Mrs. Manal Al Abdwani, Director of Industrial Relations and Information
- Mr. D.K. Saxena, Unido Advisor to the Minister of Commerce and Industry
- Dr. Faisal Elamir, Technical Advisor to the Director General of Industry
- Mr. N. Nandakumar, Project Analyst

#### UNDP Offices:

- Mrs. B.S. Al-Bakry, Programme Officer

**Background Information**

- 1) Austroplan study 1985 for Wadi Muscat Trading & Contracting Comp.
- 2) NIDC Study, July 1992
- 3) Watson Hawksley, Solid Waste Recycling Study, July 1992
- 4) Glisby, Grey Board Study. Unido Publication 1978
- 5) Foreign Trade Statistics Book 1990, Directorate General of Customs
- 6) Statistical Yearbook 1990, 19th Issue, Development Council of General Secretariat





UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

7 October 1992

DP/OMA/89/002/11-54/J12416

The substantive part of his job description is as follows:

**POST TITLE** Expert in paper recycling

**DURATION** Two weeks

**DATE REQUIRED** As soon as possible

**DUTY STATION** Muscat, Sultanate of Oman

**PURPOSE OF PROJECT** To strengthen the capability of the Ministry of Commerce and Industry in industrial planning and amending long-term industrialization strategy.

**DUTIES**

- (a) to inspect the waste and scrap paper currently being exported and state what types of paper could be made from this material;
- (b) to determine the quantities and grades of virgin pulp that should be imported to make the suggested grades of recycled paper;
- (c) to make a preliminary estimate of the economics of a recycle mill fed by the potentially available waste and scrap paper;
- (d) to give an indication regarding the possibility of buying previously-owned, reconditioned, and guaranteed equipment in Europe for setting up a recycle mill in Oman and redo the venture's economics on this basis.

Task (d) to be completed by the expert in Germany after surveying the previously-owned equipment market. If it looks promising to the Ministry, the expert shall also complete the following task:

- (e) to prepare terms of reference for a feasibility study of the paper recycle mill which he would be called to supervise.

**LANGUAGE** English; additional knowledge of Arabic would be an asset.

**QUALIFICATIONS** The candidate should have a university degree in paper technology; a minimum of ten years of paper-making experience with major manufacturing companies; be familiar with recycling processes and sources of equipment for paper recycling; and be able to source virgin pulp supplies and be aware of prices of the various grades of writing, packing and tissue papers.

Applications and communications regarding this Job Description should be sent to

Project Personnel Recruitment Section, Industrial Operations Division

UNIDO, VIENNA INTERNATIONAL CENTRE, P.O. Box 300, Vienna, Austria.



## PLUS POTS.

The revolutionary new fibre plant pot made with the patented formula of built-in fertilizer.

Since the late 1930's, the advantages of using fibre plant pots has been known and accepted by horticulturalists and keen gardeners alike. The roots of the seedling grow through the pot walls, and the seedling and pot are then planted together in the soil. There is no mess and, more importantly, there is no set back to the growth of the plant caused by transplant shock.

The one disadvantage is, that when fibre plant pots decompose, whether they are based on peat or other cellulose fibre, nitrogen is used up, and nitrogen starvation can occur around the roots of the plant.

Some manufacturers have tried to overcome this by impregnating their fibre pots with chemical fertilizers, but the problem then is that when the pots are watered the chemical fertilizers are dissolved and leach away into the soil.

After a number of years of research, with numerous plant trials, a solution to this problem has been found, which not only stores additional nitrogen in the pots but also those other nutrients that are required for strong, healthy plant growth.

The unique, patented formula used for PLUS POTS, allows a solid fertilizer and activator to be incorporated as part of the fibre pot material. The nutrients are slowly released over the life of the pot by the action of bacteria and soil micro-organisms as they convert the pot to humus.

By using a sterilized seed compost, this conversion can be kept to a minimum in the early stages, when the seed is germinating and requires no additional nutrients. The bacteria and micro-organisms will slowly build up during the first few weeks, increasing the amount

of nutrients released to the developing seedling.

When the roots of the plant have penetrated the walls of the pot, the plant and the pot are together transplanted into the soil, causing no root disturbance or transplant shock. The bacteria and micro-organisms in the soil then assist in processing the fertilizer at an even greater rate.

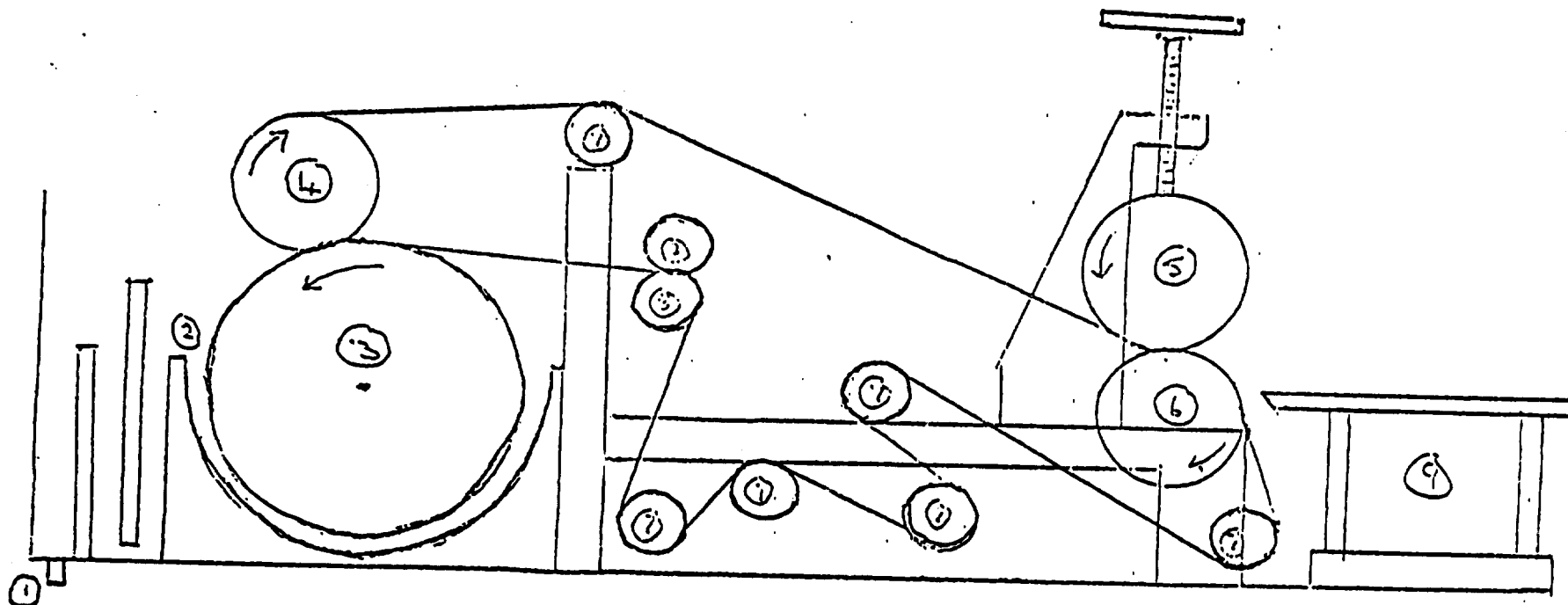
The pot material also contains a soluble fertilizer which is immediately available when the pot is watered, so there will be no set back to plants that are potted-on into the larger pots.

During warm weather the plants will grow faster and require more nutrients. The increase in temperature will also speed up the activity of the bacteria and micro-organisms, which will produce additional controlled release nutrients to meet the needs of the growing plant.

The pot material is very absorbent and its ability to take up and retain moisture is a major advantage in dry climates. The decomposed pots also add humus to the soil and will improve the soil structure in sandy or silty areas.

The pot material has also been designed to give a soft wall when moist to allow easy root penetration and prevent "balling" of the roots as occasionally happens with ordinary peat pots.

Wet Board Machine Layout



1. Stock inlet. 2. Vat. 3. Cylinder Mold. 4. Couch roll. 5. Top press roll.  
6. Bottom couch roll. 7. Felt carrying rolls. 8. Squeeze rolls. 9. Sheet table

Basis

Annex 5

cost figures 1978

- 18 -

Illustrative Projection of Financial Operating Results  
(\$x1000)

	<u>10 tons/day</u> <sup>1/</sup>	<u>5 tons/day</u>	<u>5 ton plant operating at 2 tons/day</u>
Sales (at \$ 190/ton)	566	283	113
Costs:			
Raw material <sup>2/</sup>	120	60	24
Labour and supervision	105	70	35
Depreciation	20	15	15
Power	70	35	17
Other overheads, administration and sales expenses	<u>45</u>	<u>30</u>	<u>15</u>
	360	210	106
Gross Profit before interest and income tax	206	73	7
Allowance for interest and income tax <sup>3/</sup>	<u>70</u>	<u>28</u>	<u>7</u>
Net Profit	136 ===	45 ===	0 ===
Investment:			
Machinery <sup>4/</sup>	100	75	75
Land and building	60	50	50
Working capital	<u>60</u>	<u>30</u>	<u>15</u>
Total	220 ===	155 ===	140 ===
Net profit as % of sales	24	16	-
as % of investment	62	29	-

1/ Output rating based on 24-hour operation

2/ Assumes cost of \$ 30/ton and yield of 75 %

3/ Assumes 10 % interest on one-half of the investment and 30% income tax

4/ Assumes mid-point of likely range (uncertainty is at least plus-minus 25 %)