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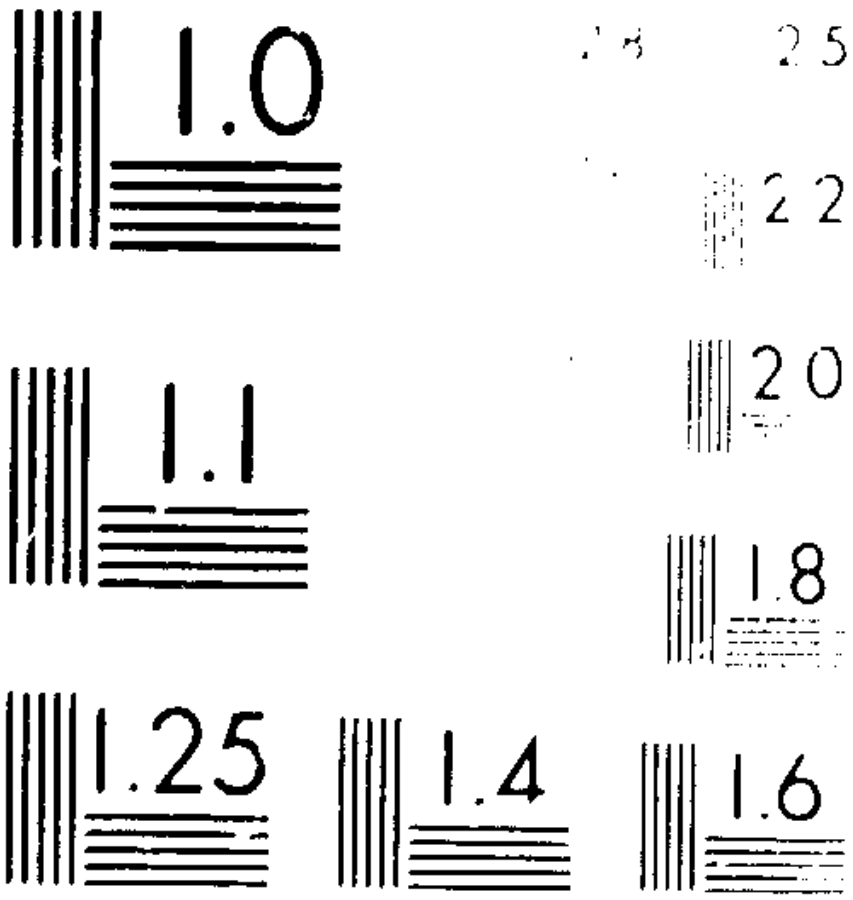
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Distr.. LIMITED
UNIDO/IO.500/Rev.1
18 November 1982
ENGLISH

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

PRODUCTION OF NEWSPRINT FROM WASTE PAPER IN NORTH AMERICA *

by

Thampoe Jeyasingam
UNIDO Expert

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PRODUCTION OF NEWSPRINT FROM DEINKED WASTE PAPER

INTRODUCTION

Newsprint is generally made using a high percentage of mechanical pulp, averaging about 80% to 90% combined with about 10% to 20% of chemical pulp. Traditionally, wood is used for producing the mechanical pulp employing processes such as Stone groundwood, Refiner groundwood, Chemi-mechanical, Thermo-mechanical, etc. On account of factors such as the high cost of wood, high cost of electric energy to convert wood to mechanical pulp, high capital cost of virgin pulp mill and emphasis on the protection of environment by recycling, the use of waste news to produce newsprint is getting well established.

This report covers details of the visits made to mills successfully operating on deinked pulp, so that this technology could be made available to countries that are facing shortage of woody materials and have also problems with foreign exchange to import newsprint to meet the local requirements.

WORLD'S DEMAND for NEWSPRINT

The total world demand in 1979 was estimated at 24,600,000 metric tons. The U.S.A. is the largest consumer of newsprint, averaging about 41% of the total demand followed by Western Europe 22%, Asia and Oceania 20% (Japan alone 10%), Eastern Europe 7%, Latin America and Africa 6% and Canada 4%. The table given below lists the various countries who are the major consumers of newsprint.

Table I - Major Consumers of Newsprint

(Source: CPPA)

1979

Demand, 000's*

Nation	Metric Tons	Percent of Total
United States	10,106	41.1
Japan.....	2,448	9.9
Britain.....	1,345	5.5
West Germany	1,207	4.9
U.S.S.R.	1,147	4.7
Canada	971	3.9
France	638	2.6
Australia	505	2.1
Netherlands	434	1.8
Brazil	310	1.3
India	296	1.2

*Estimated
Total World Demand (1979 Est.) - 24,614,000 metric tons
(Total includes People's Republic of China.)

WORLD'S SUPPLY OF NEWSPRINT

The total world's production in 1979 was estimated at 24,636 000 metric tons. About 50% of the world's supply is from North America with Canada contributing 35% and U.S.A. 15%, followed by Europe 23%, Asia and Oceania 15% (Japan alone 10%), Eastern Europe 8%, Africa and Latin America 4%. The table given below lists the countries that are the major newsprint producing countries.

Table II - Major Newsprint Producers

(Source: CPPA)

1979

Production, 000's*

Nation	Metric Tons	Percent of Total
Canada	8,756	35.5
United States	3,685	15.0
Japan	2,537	10.3
Sweden	1,479	6.0
U.S.S.R.	1,450	5.9
Finland	1,332	5.4
West Germany	574	2.3
Norway	570	2.3
Britain	345	1.4
France	310	1.3

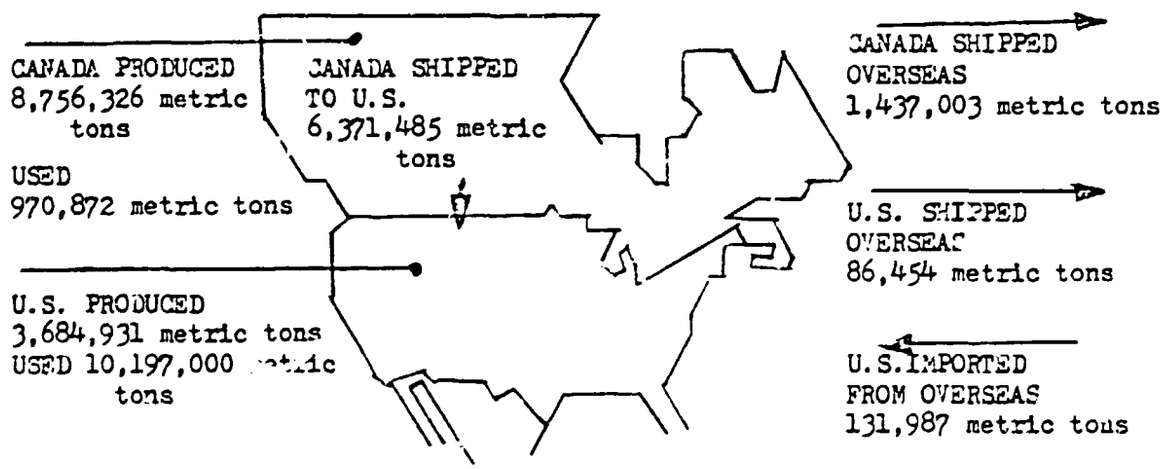
*Estimated
Total World Production (1979 Est.) - 24,636,000 metric tons
(Total includes People's Republic of China.)

WORLD'S SUPPLY AND DEMAND

North America has a vital role in holding the equilibrium between supply and demand since 50% of the newsprint is produced and 45% is consumed in this region. The excess 5% which is mainly from Canada is supplied to meet the needs of various countries, such as UK, Latin American, Asian and African countries. A graphical presentation of the flow of North American newsprints is illustrated by Sketch I.

Sketch I

FLOW OF NORTH AMERICAN NEWSPRINT, 1979



Source:
Canadian Pulp & Paper Association, ANPA

It could be therefore seen that a slight change in the supply and demand could adversely affect the small consuming countries during a tight market situation. This was practically experienced by these countries during the period 1970-1980. Although the situation is now gradually improving with new mills getting into stream, the price of newsprint has soared too high to consider newsprint as a cheap printing paper.

PRICE OF NEWSPRINT

The price of newsprint has been steadily increasing as per Table III

Table III - The price of Newsprint per Short Ton (1930 - 1981).

(Source - Newspaper and Newsprint Facts)

1930	$ 62.00	1972	$ 164.58
1935	40.00	1973	175.00
1940	50.00	1974	210.00
1945	60.25	1975	260.00
1950	101.00	1976	282.50
1955	126.00	1977	302.50
1960	134.00	1978	320.00
1965	134.00	*1979	345.00
1970	152.00	*1980	400.00
1971	157.33	*1981	470.00 to $500.00

Note: The above prices are the annual average contract prices delivered at New York City. Prices through 1973 are for 32 lbs. paper, thereafter 30 lbs.

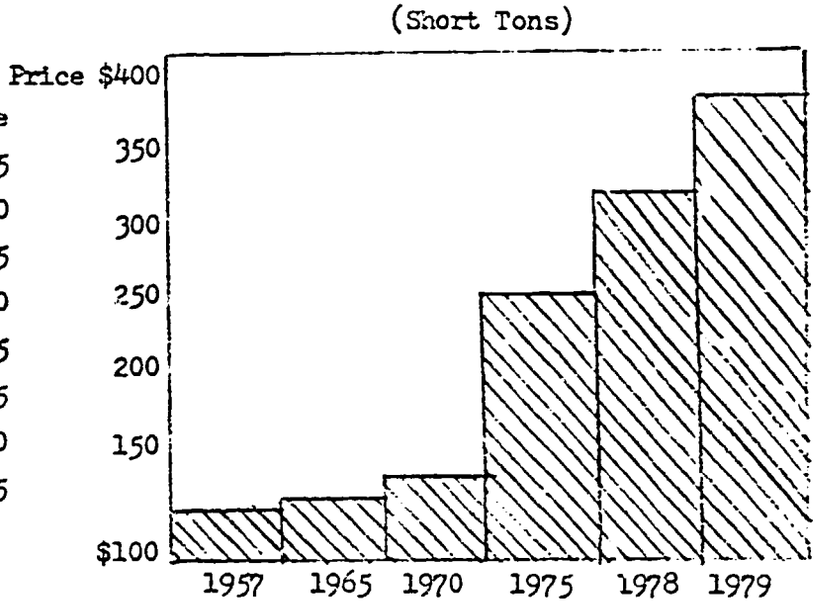
One metric ton equal 1.102 short tons.

* - The above prices are extracts from the PAPER TRADE JOURNAL

NEWSPRINT PRICES (1957-1979)

(Source: Facts About Newspapers)

Year	Price	Year	Price
1957 ...	$135	1972 ...	$265
1966 ...	140	1973 ...	200
1967 ...	143	1974 ...	235
1968 ...	143	1975 ...	260
1969 ...	148	1976 ...	285
1970 ...	152	1977 ...	305
1971 ...	160	1978 ...	320
		1979 ...	375



Note: Prices through 1973 are for 32 lbs. newsprint, thereafter 30 lb. prices. Prices given in Bar Chart are for Eastern U.S. A. effective at end of year.

During the tight period, (from 1970 onwards, as illustrated in the Bar Chart) the countries that were severely affected due to acute shortages and high prices were the less affluent countries in Asia, Africa, Latin America and Eastern Europe which largely depended on imported newsprint. In certain cases it was observed during this period the price of imported newsprint after shipping, handling and insurance costs was higher or nearly equal to the price of locally produced writings and printings.

Factors that Contribute to the High Cost

(1) The cost of wood which is the principal raw material for newsprint has been escalating rapidly due to both labor costs and land values.

(2) The price of diesel fuel increased considerably and this contributed to high transportation and extraction costs of wood as well as other materials needed for production.

(3) The high cost of process equipment machinery and buildings escalated the cost of establishing new virgin pulp mills.

(4) Energy costs increased rapidly and this in particular is considered critical for newsprint since mechanical pulp requires more electric energy than chemical pulp.

(5) New laws and regulations on environment protection required additional capital expenses to satisfy the limits that were enforced by authorities.

ANY POSSIBLE ALTERNATIVES FOR REPLACING NEWSPRINT TO COMBAT HIGH PRICES

Electronic media, such as the radio and television, were once predicted as alternatives that would gradually replace newsprint, but statistics collected in U.S.A. register a growth in the use of newsprint in spite of the rapid development and use of electronic media during the past decade. This could be seen by the following examples:

(1) Advertising Revenue

Newspapers continue to hold the major share of the advertising and exceeds the electronic media (i.e. television and radio)

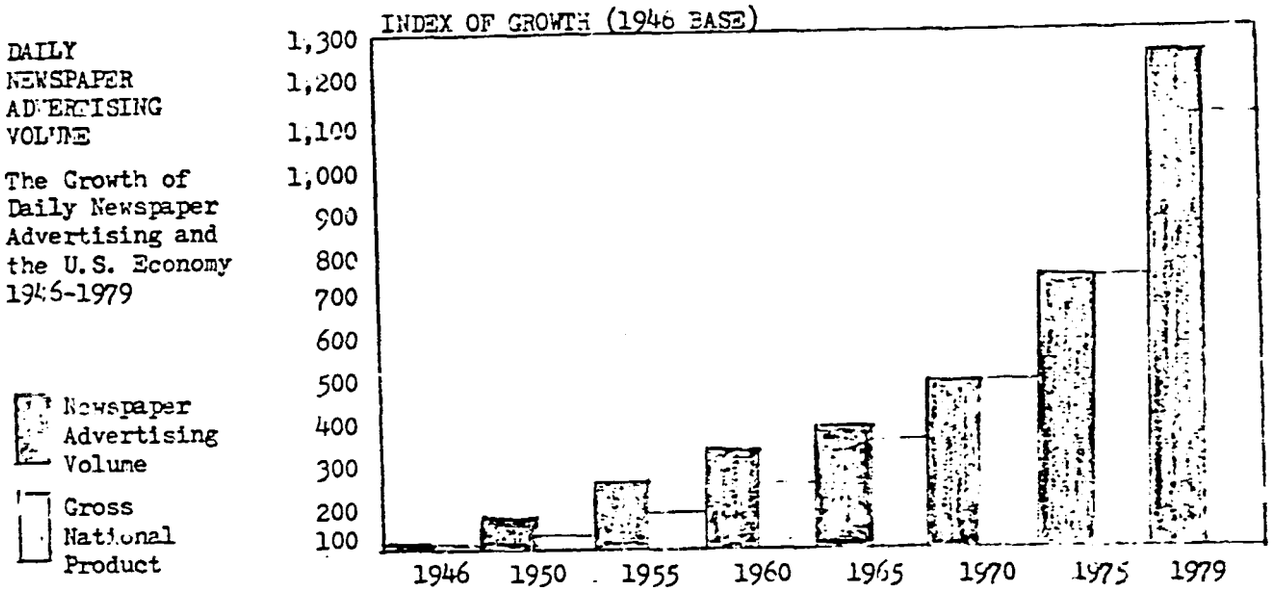
Daily Newspapers	-	29.3%
Magazines	-	5.9%
Television	-	20.5%
Radio	-	6.8%
Other	-	37.5%
		100.0%

(2) Growth in Advertising Volume

The advertising volume registered an increase as per Bar Chart below.

INDEX of GROWTH (1946 Base)

(Source - Facts About Newspapers 1980)



Year	National Advertising (millions of dollars)	Local Advertising (millions of dollars)	Total Newspaper Advertising[1] (millions of dollars)	Index	Gross National Product[1] (billions of dollars)	Index
1946	$ 238	$ 917	$ 1,155	100.0	$ 208.5	100.0
1950	518	1,552	2,070	179.2	284.8	136.6
1955	712	2,365	3,077	266.4	398.0	190.9
1960	778	2,903	3,681	318.7	503.7	241.6
1965	784	3,642	4,426	383.2	684.9	328.5
1970	891	4,813	5,704	493.9	977.1	468.6
1971	991	5,207	6,198	536.6	1,054.9	506.0
1972	1,103	5,905	7,008	606.8	1,158.0	555.4
1973	1,111	6,484	7,595	657.6	1,294.9	621.1
1974	1,194	6,807	8,001	692.7	1,406.9	674.8
1975	1,221	7,221	8,442	730.9	1,516.3	727.2
1976	1,502	8,408	9,910	858.0	1,700.1	815.4
1977	1,677	9,455	11,132	963.8	1,887.2	905.1
1978[1]	1,787	10,920	12,707	1,100.2	2,106.9	1,010.5
1979[2]	2,085	12,500	14,585	1,262.8	2,369.5	1,136.5

[1] Revised figures

[2] Preliminary figures

Source: U.S. Department of Commerce, McCann-Erickson Inc., Newspaper Advertising Bureau

(3) Ratio of Advertising Content

The ratio of the advertising content to the total content of U.S. daily and Sunday newspapers showed an increase, and this could be seen as per table given below.

Table IV - Advertising Content (1950 to 1978)

(Source - Media Records)

Year	Mornings	Evenings	Sundays	Total
1950	57.5%	60.4%	54.6%	54.5%
1955	60.9	61.8	58.2	60.7
1960	60.2	60.3	56.4	59.4
1965	60.9	61.0	59.1	60.5
1970	61.6	61.4	61.5	61.5
1975	63.2	63.0	65.7	63.7
1976	62.7	62.1	66.5	63.5
1977	62.4	61.3	66.6	63.1
1978	62.4	61.5	67.4	63.4

(4) Total Number of Daily Newspapers Published

The total number of newspapers published in U.S.A. in 1979 amounted to 1763, comprising 382 morning and 1405 evening papers. The Sunday newspapers reached an all time high of 719. Details of growth from 1940 to 1979 are as per table.

Table V - Number of Daily Newspapers

(Source - Editor and Publisher

Year	Morning	Evening	Total M & E[1]	Sunday
1940	380	1,498	1,878	525
1945	330	1,419	1,749	485
1950	322	1,450	1,772	549
1955	316	1,454	1,760	541
1960	312	1,459	1,763	563
1965	320	1,444	1,751	562
1970	334	1,429	1,748	586
1971	339	1,425	1,749	590
1972	337	1,441	1,761	605
1973	343	1,451	1,774	634
1974	340	1,449	1,768	641
1975	339	1,436	1,756	639
1976	346	1,435	1,762	650
1977	352	1,435	1,753	668
1978[2]	355	1,419	1,756	696
1979[3]	382	1,405	1,763	719

continued from Table V - Number of Daily Newspapers:

[1]There were 24 "all-day" newspapers in 1979. They are listed in both morning and evening columns but only once in the total

[2]Revised figures

[3]Preliminary figures

(5) Daily Newspapers in Circulation

The daily newspaper circulation increased from 50,927,505 in 1946 to 62,223,040 in 1979.

Table VI - Growth in Newspaper Circulation

(Source - Editor and Publisher)

Year	Total Morning and Evening	Sunday
1946	50,927,505	43,665,364
1950	53,829,072	46,582,348
1955	56,147,359	46,447,658
1960	58,881,746	47,698,651
1965	60,357,563	48,600,090
1970	62,107,527	49,216,602
1971	62,231,258	49,664,643
1972	62,510,242	50,000,369
1973	63,147,280	51,717,465
1974	61,877,197	51,678,726
1975	60,655,431	51,096,393
1976	60,977,011	51,565,334
1977	61,495,140	52,429,234
1978[1]	61,989,997	53,990,033
1979[2]	62,223,040	54,367,487

[1]Revised figures [2]Preliminary figures

GROWTH IN NEWSPRINT CONSUMPTION IN U.S.A.

It could be therefore seen from the above statistical data the use of newsprint to publish newspapers marked a strong, healthy economic position through the decade 1970 to 1980 in spite of: -

- Developments in electronic media
- Eccnomic control
- Increasing inflationary trends
- Tight newsprint supply
- Fuel shortages

On account of this healthy position the consumption of newsprint increased from 9 million tons in 1970 to 11.2 million tons in 1979.

Table VII - Showing Newsprint Consumption in U.S.A.

(Source - ANPA, U.S. Department of Commerce)

Year	Newsprint Consumption[1]	Growth Index	Real GNP[2]	Growth Index
1966	8,582	100.0	981.0	100.0
1970	9,119	106.3	1,075.3	109.6
1971	9,250	107.8	1,107.5	112.9
1972	9,941	115.8	1,171.1	119.4
1973[3]	10,794	125.8	1,233.4	125.7
1974[3]	10,284	119.8	1,210.7	123.4
1975[3]	9,254	107.8	1,191.7	121.5
1976[3]	9,611	112.0	1,271.0	129.6
1977	10,230	119.2	1,332.7	135.8
1978[3]	10,874	126.7	1,385.3	141.2
1979[4]	11,240	131.0	1,431.7	145.9

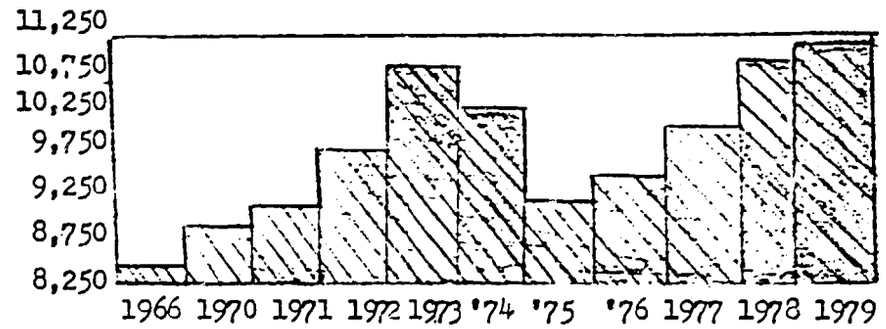
[1] 30-pound basis weight

[2] Gross National Product in 1972 dollars

[3] Revised figures

[4] Preliminary figures

Bar Chart Showing Growth in Newsprint Consumption (Thousands of Short Tons) in U.S.A.



Growth in Newsprint Consumption and Future Raw Material Supply

As discussed earlier despite the high prices, the demand for newsprint has been gradually increasing. Although this is quite encouraging to newsprint producers, there is growing concern regarding the availability of wood. Most of the large companies are approaching the annual sustained harvests from existing forest resources. On the other hand the industry being quite sensitive to this problem has continued to make improvements to face this challenge. Some of the progress so far made in this direction are as follows:

- Lowering basis weight from 32 lbs to 30 lbs, thereby stretching the printed area per ton of newsprint
- Development of new technology to use inferior species for newsprint which were earlier considered not suitable such as hardwoods, and even agricultural residues, such as bagasse.
- Active reforestation and planting of "SUPER" trees with high yield and short cycles
- Recycling and the use of deinked pulp from waste news to produce newsprint

Recycling - An Answer to Several Problems

Out of all the improvements listed above, recycling to produce newsprint from deinked waste news is considered an outstanding achi because it is an answer to several problems connected with the [illegible]ry.

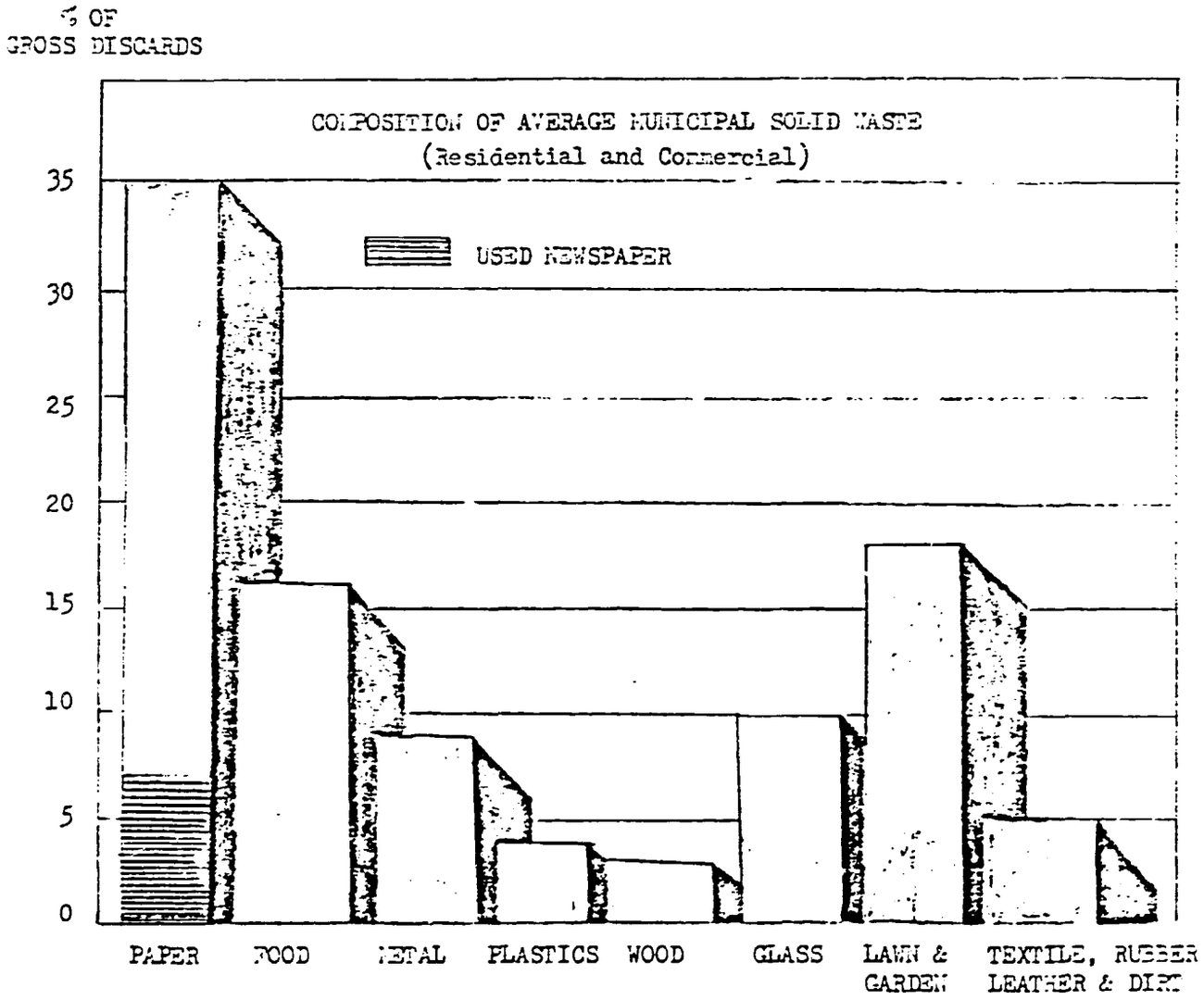
- Protection of environment by recycling waste
- Conservation of forestry
- Reduction of electric energy usage since virgin mechanical pulp mills require 4 times the energy
- Reduction in water usage since deinked pulp mills require less water
- Reduction in capital costs since deinked pulp mills require less capital than virgin mechanical pulp mills.

The mills in U.S.A., realizing these advantages have made considerable progress in using deinked pulp for producing newsprint in a highly competitive market with Canadian newsprint being available just across the border. The progress made is remarkable since there are some mills operating with 100% deinked pulp with no chemical pulp at all being used as reinforcement fiber for better runnability and quality improvements.

The following pages therefore will discuss the technology used in these mills using a high percentage of deinked pulp for newsprint production through information gathered by personal discussions with the principal executive officers of the mills that were selected for this study.

It should be also noted there are two methods available for removal of ink (i.e. Floatation and Washing) from fiber. The deinking practice in U.S.A. is based mainly on the washing system. The newsprint mills visited in U.S.A. consider the washing system has advantages and this is the technology discussed in this study.

Composition of Average Municipal Solid Waste in U.S.A.



SOURCE: U.S. ENVIRONMENTAL PROTECTION AGENCY, MAY 1978

GARDEN STATE PAPER COMPANY

Garfield Mill (New Jersey)

Date of Visit - Sept. 8, 1981

Mill Data

Pulp Mill

Type of Pulp	-	100% Deinked Pulp from Waste News
Capacity	-	Av 600 TPD
Equipment Used	-	1. Truck Tipper
		2. Pulper (Continuous - Edge Wall Board)
		3. High Density Centrifugal Cleaners
		4. Flat Vibration Screens
		5. Vertical Pressure Screens
		6. Decker Washers arranged for three stage counter current.

Paper Mill (consisting of two machines)

Capacity	-	Av 530 TPD
No 1 Machine	-	Rice Barton
		Forming Section - Fourdrinier
		Width 230", Trim 210"
		Speed 2 300 FPM
No 2 Machine	-	Rice Barton
		Forming Section - Twin Wire Papri Former
		Width 260", Trim 240"
		Speed 3 000 FPM
Water Supply	-	Passaic River
		Average Usage 7 MGPD
Effluent Treatment	-	Primary treatment and discharge into municipal sewer

Interview with Mr. Richard Scudder
Chairman of the Board

Mr. Scudder is the pioneer in the commercial development and application of 100% recycled fiber for newsprint production from waste news. His initiative led to the establishment of the Garfield Mills in New Jersey. This was followed by the establishment of mills in other parts of the USA such as the Pomona Mills in California, the Allsip Mills in Illinois and the SE Paper Manufacturing Company in Dublin. Based on Garden Paper Technology there are also mills operating outside the USA, one in Mexico and another in Japan.

Waste News Collection and Quality Requirements

Q. Generally newsprint is made with 85% to 90% of SGWP, RGWP, or TMP blended with 15% to 10% of chemical pulp. I understand you make newsprint with 100% recycled waste news. In your operation have you found it necessary at any stage to use chemical pulp to improve either runnability or quality?

A. No, we are quite successful in our operation using 100% recycled waste news.

Q. What is the average composition of the waste news fed into the pulper in terms of the following categories:

- household waste news
- over issues
- printer's waste

A. We do not make a distinction between printers' waste and over issues since printers' waste is relatively small. We therefore combine over issues and printers' waste as one category which would average 20% and the rest 80% is therefore household waste news.

Q. In the household waste what percentage would be magazines and other printed matter? Do you insist that magazines and journals be excluded in your waste news supply?

A. We do not like to have too much of magazine grade and other printed matter other than waste news but our technology will be able to tolerate small amounts. Now and then we do of course reject truck loads containing excessive waste other than printed news.

Q. Based on the classification made by the Paper Stock Institute of America what are the grades that are considered suitable for deinking employing your technology?

A. They are grades (8) and (9). (Note: Grade 8 is special news deink quality and Grade 9 is over issue news.)

Q. What do you consider the economic distance for transport of waste news to your mills at Garfield?

A. This would be a radius of about 250 miles but we could even go beyond this distance on the basis of delivering a load of newsprint to our customers and returning back with waste news collected from that particular area.

Q. Do you have any problems in collecting the required amount of waste news for your Garfield mill?

A. We have no problems at all. In fact, at the moment our supply is more than what we need.

Q. I understand New Jersey has a mandatory recycling law.

A. Yes, that is correct.

Q. How does the proposal to use household garbage (which I believe contains about 40 - 45% waste paper by weight) to generate thermal energy in solid waste burning plants affect your recycling operation.

A. In New Jersey we may not be affected due to the mandatory law enforced by the State.

Q. What are the positive steps that have to be taken in order to make the collection of waste news from households very effective?

A. We have found it necessary to establish various collection centers in order to make it easier for the consumers to deliver the waste news to their centers directly and get paid for it immediately.

Q. What is the role of the waste paper dealer in this situation where you are trying to collect the waste paper directly from the consumer?

A. We believe the middleman should also survive since he plays an important role in recycling by collecting all types of waste from the consumer at his recycling center. He then classifies them into categories such as newsprint, corrugated containers, mixed papers, ferrous metals, aluminium, glass etc. This is therefore an important recycling function and we are only interested in waste news. However, we like to compete with him in order to hold the price right for the waste paper required by our mills.

Economics of Recycling Waste News

Q. I believe there should be considerable savings in energy operating a recycling mill compared to a virgin fiber newsprint mill.

A. Yes, there is considerable savings but this could vary from mill to mill. However, based on a study made for us by one of the consultants, a virgin fiber pulp mill integrated with a newsprint machine would require about 40 000 000 BTU per ton, whereas a recycling newsprint mill would require about 20 000 000 BTU per ton. This is the total energy required in terms of heat as well as electric energy. Due to various energy conservation programs we have made in our mill during the past two years we have reduced the heat and electric energy requirements to about 14 000 000 BTU per ton during the winter months and to about 11 000 000 BTU per ton during the summer months.

Q. How much is your heat and energy requirements for the deinking operation alone?

A. We have not worked out this figure separately.

Q. What is the water consumption in a recycling newsprint mill?

A. Our water consumption with 100% recycled fiber usage is about 10 000 gals per ton and this covers both the deinking operation as well as paper making.

Q. In terms of capital investment there should be considerable savings in setting up a recycling newsprint mill compared to a virgin mill using refined groundwood pulp on TMP to produce newsprint; how will you estimate these figures?

A. It is very difficult to estimate capital investment without going into details and it is more difficult with today's inflationary prices. However a very approximate figure based on projects started up within the last two years (1979 - 1980) would be as follows:
- Virgin Pulp Mill (TMP) and Newsprint Mill. (Complete Project)
  600 TPD - $ 180 Million
- Recycling Mill (100%) and Newsprint Mill. (Complete Project)
  600 TPD - $ 120 Million

Q. What is the percentage of fiber recovery on yield from the pulper to the machine chest?

A. Our yield is about 83% which will include losses on screens as rejects and foreign matter such as twines and ropes used for bundling. It also includes fiber losses in the form of fines etc.

Quality and Runnability

Q. What are your quality problems using 100% recycled waste news?

A. We have no serious problems using recycled fiber.

Q. What about runnability on the paper machine and the printing presses?

A. We are not limited on speeds. The two machines we are operating are operating close to the designed speeds. Our No 1 Machine which is a fourdrinier, operates at about 2 250 to 2 280 FPM and the No 2 Machine with a Papriformer operates at about 2 800 to 2 850 FPM. In fact using 100% recycled fiber, the SE Paper Co. machine, which is a Belbaie machine and is of new design with Trinip Press etc, operates at about 3 400 FPM. We are therefore not limited on speed on account of 100% recycled fiber.

Q. Now that you are making 30 lbs with 100% recycled fiber could you make 28 lbs (48 g/m^2) newsprint at corresponding speeds with no chemical reinforcement pulp?

A. We do not see any problem in going down in basis weight from 30 to 28 lbs.

Q. The repeated recycling of the same fibrous material should obviously reduce the strength. How do you view this situation?

A. We have found the properties are not adversely affected and repeated recycling is possible up to 8 times. Then of course we do not entirely feed the pulper with our own recycled newsprint. The composition of our recycled newsprint mixed with newsprint that was made from virgin fiber would possibly amount to less than 50%.

Q. What will you consider as the optimum composition for feeding your pulper, that is to say the ratio of recycled newsprint to virgin fiber newsprint?

A. We consider a 50 to 50 percent composition is quite satisfactory for maintaining the required quality and runnability.

Q. What is the percentage of ash in the deinked pulp?

A. We do not test for ash since newsprint made in the USA does not contain fillers.

Q. What about the ash content in clay coated magazines and printed material in the waste news?

A. This is a negligible quantity.

Q. How does recycled newsprint compare with virgin fiber newsprint in terms of linting, printability, show through etc?

A. In respect of linting recycled newsprint may be slightly below virgin fiber, but it is believed TMP also has linting problems. In respect of printability recycled fiber out performs virgin fiber and could be rated excellent. Regarding show through, recycled fiber newsprint is better than virgin fiber newsprint.

Q. Are you working on the linting problem?

A. Yes, we feel the linting problem of deinked pulp is due to water absorbency. We are now getting better results using starch additives. (Aquapel etc)

Deinking Plant (Garfield)

Q. What type of pulper are you using and is it Batch or Continuous?

A. We are using Edge Wall Board type pulpers and they are designed for continuous operation.

Q. Do you add your deinking chemicals to the pulper?

A. Yes

Q. Is it necessary to raise the temperature of the water used in the pulper?

A. Our technology does not require a higher temperature and there is no need to heat the water used in the pulper.

Q. Are you then using paper machine back water without heating?

A. Yes we use the paper machine back water.

Q. Can you use paper machine water containing Aluminium Sulphate ions?

A. We do not use Alum on the paper machine.

Q. How much time do you allow in the Pulper?

A. About 20 mins.

Q. I notice your cleaning equipment consists of H. D. cleaners, Johnsson screens and pressure type screens (Bird Centriscreens). Is this cleaning equipment adequate for you?

A. Yes they are quite satisfactory for us.

Q. Do the plastic strings and twines that are used for bundling newspapers jam up the Bird screens?

A. We normally insist on waste news free from strings and twines. A good percent of the plastics and string material get removed in the ragger

and Johnsson Screens. It is of course necessary to clean the Bird centriscreens off and on when they get fouled up with these materials.

Q. I notice your equipment for washing away the ink consists of 3 stage counter current deck washers. What is the mesh you have on these washers?

A. We use a 60 mesh facing wire and 40 mesh backing wire.

Q. Since your 1st Stage Decker water would have a high concentration of ink particles, do you discharge them into the drain?

A. Yes we discharge them into the municipal sewer and our effluent system is connected in this manner.

Q. I believe some mills use Side hill screens for washing deinked pulp. What do you think of such an application?

A. It has its advantages as well as disadvantages. We have such an application at the Pomona Mills in California. I feel we lose more fiber on Side hill screens and they occupy much space. In my opinion if Side hill screens are used they should be combined with decker washers in the following manner - 1st and 2nd stages Side hill and 3rd stage decker washer.

Paper Machine and 100% Recycled Fiber

Q. What do you consider better suited for 100% recycled fiber - twin wire or fourdrinier?

A. We consider a twin wire performs better on 100% recycled fiber based on results at S E Paper Co. which operates a Belbaie 2 at high speeds; but I believe a fourdrinier should be satisfactory for slow speeds and our No 1 Machine as you know is a fourdrinier operating at about 2 250 FPM.

Q. What sort of press configuration is best suited for 100% recycled fiber newsprint?

A. I feel the trinip press arrangement is quite good again based on results at S E Paper Co. (Dublin)

Q. Do you experience problems with felts getting plugged up due to fiber fines and ink particles?

A. No, we do not have any problems with felt life.

Q. Have you any air entrapment problem in the paper stock?

A. We believe a Deculator is essential on the paper machine.

Q. I notice you are not using your breaker stack.

A. Yes, we feel we could skip the breaker stack.

Deinking Chemistry

Q. What deinking chemicals do you use in your mills?

A. The deinking chemistry is our own development. It was developed here at this mill in Garfield. Our mill here and our associated mills are the only ones using 100% waste news to produce newsprint. The mill is presently owned by Media General Inc. and anyone interested in using our technology for deinking has to buy these rights from Media General Inc.

Q. What are the Mills in the USA that use your Deinking Chemistry?

A. Besides our mills here at Garfield we have the Pomona mills (California), Altsip mills (Illinois) and S E Forest Mills in Dublin (Georgia).

Q. What are the mills overseas working with your deinking knowhow?

A. There is a mill in Mexico, one in Japan and we are presently negotiating for a mill in Spain.

Q. Mr. Scudder, since you pioneered and developed this process for commercial application, how can other countries obtain this knowhow?

A. Since GSP mills are owned by Media General Inc. you may have to speak to them directly on this subject. If you desire I can connect you on the phone with the Senior Vice President of Media General, Mr. James E. Evans who is located in Virginia.

Telephone Interview with

Senior Vice President Mr. James Linen

(Mr. James E. Evans was not available at this time.)

Q. I have already seen your GSP mill at Garfield and I have discussed the subject of deinking with Mr. Scudder, Chairman of GSP mills. Your technology is of interest to entrepreneurs who wish to recycle waste news to produce newsprint. Could you tell me how one could obtain this knowhow from you i.e., what would be the cost and under what terms could it be obtained?

A. We are interested in sharing our knowhow in this field. We have, as you are aware, mills within the USA as well as overseas based on our system of deinking. The deinking chemistry is our proprietary process. The basis of giving our knowhow will depend on the merits of each case. If anyone is interested in our knowhow they should write to me (Mr. James Lenin) or Mr. James E. Evans. Our address here is as follows:

Media General Inc.
33 Grace Street
Richmond
Virginia

Tel No (804) 649 - 6000

GARDEN STATE PAPER COMPANY

POMONA, CALIFORNIA

Date of Visit - October 2, 1981

Mill Data

Pulp Mill

Type of Pulp - 100% deinked Pulp from Waste News

Capacity - 310 tons/24 hrs and after rebuild this year 375 tons/24 hrs

Equipment Used -

1. Bucket with electric hoist to feed pulper
2. Two batch pulpers feeding into a single continuous pulper
3. Trash screen for continuous pulper during flushing
4. H. D. Cleaners
5. Johnsson screens for primary stage
6. Johnsson screens for secondary stage
7. Beloit - Jones vertical presses
8. Side hill washers in 3 stages arranged for counter current washing

Paper Mill (consisting of one machine)

Capacity - 310 tons/24 hrs and after rebuild this year 375 tons/24 hrs

Type of machine - Fourdrinier Rice Barton
The rebuild will have a BEL-BOND forming section added after rebuild

Width	-	260"-trim 240"
Speed	-	2 500 FPM
Fiber furnish	-	100% deinked pulp from waste news
Water supply	-	Sanitary sewage plant water used after processing
Effluent	-	Discharged into the municipal sewer, after primary treatment

Interview with Mr. Alan R. Crossman

Procurement Manager (Western Region)

Q. Are you operating collecting centers to collect waste news?

A. Yes, we operate 6 waste news collection centers, 3 in the Los Angeles area and 3 in the San Diego area.

Q. Who brings this waste to your collection centers?

A. The waste newspapers are brought by individuals, church groups and other organizations that wish to finance some communal development projects.

Q. What are the different sources of your supply?

A. They are as follows:

- Long term reliable contracted supply	50%
- Other contracted supply (flexible sources)	30%
- Municipality collection along with garbage	10%
- Collection center supply by individuals, church groups, etc.	10%
Total:	100%

Q. What are your problems in the collection of waste news?

A. We have no problems in collecting the required quantity of waste news, but being located on the West Coast we do experience export drives (off and on) to promote the export of waste news to Japan, Korea, etc., and this causes high prices in the domestic market and instability of prices.

Q. What are your problems in respect of quality, due to the mixed supply of magazines and other grades of paper along with waste news?

A. You will be surprised we have been quite successful in promoting source separation to such a degree that the quality of waste news supplied to our mills is quite satisfactory.

Q. Do you have to carry an inventory to hold prices stable?

A. Yes, we hold about 3 months stock.

Q. How successful is the recovery of waste news in your area of collection?

A. We are successful in recycling about 40% of the printed news paper circulated in this area.

Q. To achieve good deinking results it is considered necessary to store the waste news under cover to prevent both sunlight as well as moisture affecting the quality of the raw material. Do you, therefore have adequate storage facilities?

A. Yes, we store them under cover.

Q. I read in a technical journal you have successfully overcome the high cost of storage by developing a new type of warehouse. By how much have you reduced your capital expenses and what is this new type of storage facility?

A. You can have a look at it while you go through the plant. The construction of the framework is of light steel and for the roof and sides, which is all made up as a dome, the material used is vinyl. I believe we have reduced the capital cost by about 50% compared to a conventional type of warehouse.

Q. What is the size of this new type of warehouse?

A. Length 900 ft., width 125 ft and height 54 ft.

Discussion with Mr. William Toby

Product Manager

Q. I notice in your raw material warehouse you have part of your stock in pallets instead of bales.

A. Yes, we do receive part of our supply from church groups and voluntary organizations in pallets. Each pallet contains about 1 ton. These organizations are too small to make capital investments on balers and we too prefer pallets for quality reasons. If they are supplied in pallets we could notice contaminants more easily, since a pallet is made up of folded newspapers. The only problem we have with the pallets is the stack height, as we cannot have more than 2 stacks due to the weak frame structure of the pallet.

Deinking Plant

The deinking of waste news first undergoes mechanical and chemical treatment in 2 batch pulpers. The feeding of waste news to the batch pulper is by a bucket. The bucket is filled by a tractor that is fitted with a dozer blade. For fast and efficient filling the bucket is kept in a concrete pit below the surface level of the raw material supply area. Once the bucket is full to the required weight, which is determined by a load cell, it is lifted by a mono rail crane to the batch pulper.

The batch pulpers do not have perforated extraction plates and after about 20 minutes pulping along with deinking chemicals, the stock is discharged into the continuous pulper. The continuous pulper has an extraction plate with perforations of 1/4 inch. It is also fitted with a ragger to remove stringy contaminants. Periodically, about two times a shift, the continuous pulper is flushed out, by opening a drain valve. The flushed out contents of the pulper are mainly trash materials that collect over the pulper perforated plate. The trash screen rejects the trash to a collecting bin and the accepts

which contain the useful fiber are recycled back into the continuous pulper. The continuous pulper discharges into the pulper dump chest at about 4 1/2% consistency. From the dump chest the stock is delivered to a battery of high density cleaners. The accepts from the high density cleaners are fed into a battery of Johnsson screens arranged in 2 stages (primary and secondary). The accepts from the primary Johnsson is fed into a Beloit - Jones vertical screw press. From the vertical press the stock is delivered to a mixing tank. The stock from the mixing tank is supplied to side hill washers in 3 stages with counter-current washing. The washed pulp at the end of the 3rd stage is delivered to the machine chest.

Interview with Mr. Stanley A. Bazela

Manufacturing Manager

Q. I have seen the deinking mills for producing newsprint at Garfield, Altsip and Dublin, but this is the only mill I have seen operating with side hill washers. How do you like this system of washing?

A. Side hill washers are simple pieces of equipment. They do a fairly good job for us. The disadvantage mainly is the large space they require. If we have to build a new system we will, of course, favor deckers in place of side hill washers.

Q. What is your inlet and outlet consistency on these side hill washers?

A. Our inlet is 1% and outlet is 6%.

Q. I understand, you are using sewage water after treatment for process. Is this correct?

A. Yes, our mill is located close to the city sewage treatment works, and we use this water. It is difficult to get water in this area since we do not have large rivers.

Q. How much water do you use per ton of newsprint on the basis that paper machine water is recycled in the deinking plant?

A. We consume about 7 200 gals/ton of newsprint.

Q. I notice you have a breaker stack but you are not using it.

A. Yes, we do not find the need to use the breaker stack.

Q. What is your first pass retention using 100% recycled fiber on your Fourdrinier?

A. We get about 72%.

Q. What retention do you expect after the rebuild with your BEL-BOND?

A. About 67%.

Deinking Chemistry

The deinking chemistry of this mill is available for interested parties on the basis explained under Garden State Paper Mills, Garfield, (N.J.) from the present owners, Media General, Inc.

FSC PAPER CORPORATION

(Field Scudder Container Paper Corporation)

(An affliate of Garden State Paper Company,

Field Enterprises and Pioneers)

ALSIP, (ILLINOIS)

Date of Visit - Sept. 18, 1981

Mill Data

Pulp Mill - 100% deinked pulp from waste news

Capacity - 310 tons/24 hrs

Equipment used - 1. Bucket with electric hoist to feed pulper

2. 3 batch pulpers feeding into one continuous pulper

3. Trash screen for continuous pulper during flushing

4. HD cleaners

5. Johnsson screens (primary and secondary stages)

6. Inclined screw presses (extractors)

7. Decker washers in 2 stages arranged for counter current washing

Paper Mill (consisting of one machine)

Capacity - 310 tons/24 hrs

Type of machine - Fourdrinier (Rice Barton)

Width - 260", trim 240"

Speed - 2 500 FPM

Fiber furnish - 100% deinked pulp from waste news

Water supply - Calumet Sag canal

Effluent - Primary treatment and then discharged into municipal sewer

Deinking Plant

The first step in the deinking of waste news is the mechanical and chemical treatment in the batch pulper. There are 3 batch pulpers and waste news is fed into these pulpers by means of a bucket fitted with a quick discharge flap door at the bottom. For fast and quick filling of the bucket a tractor with a dozer blade is used. The bucket is lowered by the electric monorail hoist into a concrete pit, so that the tractor could push bundles of waste paper into the steel rectangular bucket. Once the bucket is full, it is lifted out of the pit and emptied into one of the batch pulpers. For the correct dosage of the deinking chemicals the weight loaded into the pulper is carefully controlled by means of a load cell fitted onto the bucket. Each pulper is loaded to 8 000 lbs. After defiberization and chemical treatment with the deinking chemicals, the contents of each batch pulper is discharged into the continuous pulper. The batch pulper is not fitted with perforated extraction plates whereas the continuous pulper is fitted with extraction plates of perforations 1/4 inch diameter. The continuous pulper is also fitted with a ragger. Contaminants found in the waste news such as strings and plastic materials are removed by the ragger. The trash materials that do not pass through the extractor plate are flushed out, twice a shift, on to a trash screen located below the continuous pulper. The reject from the trash screen is collected in a trash bin, whereas the accept which contains useful fiber is recirculated back into the continuous pulper.

The fibrous material, after treatment in the continuous pulper, is discharged into the dump chest. From the dump chest the stock is delivered to high density cleaners and from the cleaners the accept could be either delivered to Beloit - Jones vertical pressed or Himac

inclined screw presses. The Himac inclined screw presses could increase the consistency of the stock from 4 1/2 %, delivered from the high density cleaners, to about 12%, whereas Beloit - Jones press could increase the consistency from 4 1/2% to 25%. The discharge from the screw presses, both Beloit - Jones as well as Himac, are lowered to a consistency of 4 1/2% in a mixing tank.

From the mixing tank the stock is delivered to Johnsson screens in two stages (i.e. primary and secondary). The accepts from the primary screens are washed on decker washers arranged in 2 stages for counter current washing. The washed pulp from the decker washers is then discharged into the machine chest.

Interview with Mr. Wayne K. Hutton
Paper Mill Superintendent

Q. The newsprint you are producing at this mill is from 100% recycled waste news?
A. Yes, that is correct.

Q. What is the average speed on your machine?
A. About 2 500 FPM.

Q. What is the top operating speed?
A. 2 700 FPM.

Q. Have you any problems on runnability at 2 500 FPM to 2 700 FPM, using 100% recycled fiber?
A. No, we do not have any problems on runnability at these speeds.

Q. What do you consider a bad run on the machine in terms of paper breaks and what is the equivalent down time?
A. 4 breaks per 24 hrs which is roughly 1 hour and 30 minutes down time.

Q. I see you have a new head box (Converflow Head Box).

A. Yes, we replaced the pressure head box with a Converflow Head Box and we are satisfied with its performance.

Q. Do press room people complain about breaks?

A. No, we do not receive such complaints.

Q. How fast do they run your paper?

A. The Chicago Sun, Times etc. run at 56 000 copies per hour.

Q. How often do they have a break in the press room using your paper?

A. On the average it could be 30 rolls a break in the press room.

Q. Have you any problems with dusting and linting?

A. We have no serious problems, but we do use suitable additives as binders (e.g. modified starch etc.).

Q. I see you have a Fourdrinier. Which works better, a twin wire or a Fourdrinier?

A. A Belbaie is now operating in this country with 100% recycled fiber and they have better results than the Fourdrinier.

Q. I see you have a breaker stack and you are using it. What are the advantages of using the breaker stack?

A. We get better smoothness, about 2 mils on caliper, but the biggest advantage is less dusting.

Q. What sort of life do you get on your pick up/first press felt? I suppose deinked pulp has a tendency to dirty the felts and plug up much faster.

A. We get about 80 days.

Q. Do you think deinked pulp requires less steam to dry the paper? How will you compare it with a virgin fiber newsprint mill?

A. Yes, recycled newsprint requires less steam; I would say about 1.7 tons of steam per ton of newsprint, and a virgin fiber mill would require about 2.2 tons of steam per ton of newsprint.

Q. How much electric energy does a recycled fiber newsprint mill require and how does this c mpare with virgin fiber mill, say either TMP or refiner ground wood?

A. We do not have any data on this subject.

Q. How much water do you consume for the whole mill (pulp and paper) on the basis of one ton newsprint?

A. About 18 000 gals per ton of newsprint.

Q. I note your press configuration is quite simple with a pick up and 1st press granite roll combination followed by a second press with top granite and steel venta nip. Are you satisfied with these two presses?

A. Yes, we are satisfied with this system for the current speed of 2 500 to 2 700 FPM, but if we go higher in speeds a tri nip press would be needed.

Q. What is your yield on deinked pulp?

A. We get about 85% yield after allowing for screen losses, moisture differences (i.e. between the raw material 15% and moisture on reel, 8%) and for ink weight (1 1/2 to 2%).

Q. What do you think of the fiber fines in the paper stock? Are they a concern for you on paper machine operation?

A. I consider fines are necessary to get good printing characteristics.

Q. What is the CSF value of your stock in the machine chest?

A. It is about 175 CSF.

Q. I suppose the opacity is also improved using deinked pulp compared with virgin fiber pulp.

A. Yes, we get excellent opacity with deinked pulp

Q. What is the brightness of your paper?

A. We get about 60 GE.

Q. What is the PH of your stock in the head box?

A. The PH is about 6% to 7%.

Q. Are you using alum to control the PH on the machines?

A. No alum is used.

Q. Have you a deculator on the paper machine to avoid foam problems?

A. Yes, we do have a deculator.

Q. In the deinking mill I notice you have both Himac inclined screw presses as well as Beloit - Jones vertical presses.

A. Yes, we are adding new Himac screw presses to obtain more deinked pulp production.

Q. What is the inlet and outlet consistency of these Himac presses and what is the mesh of the screen plate?

A. The inlet of the Himac is 4 1/2% and outlet is 12% and we use a screen mesh of 0.062 inch perforations.

Q. I note you have 3 Himac screws. What is their total capacity and what is the drive motor capacity for each screw?

A. The 3 screws will have a capacity of 210 tons per 24 hrs, and each screw is driven by a 20 HP motor.

Q. You have, I notice, only a 2 stage washing system with decker washers. Is this washing enough?

A. Although it is enough for us we will recommend a 3 stage washing for the future.

Q. What is the inlet and outlet consistency for the decker washers?

A. The inlet is 2% and outlet is 11%.

Q. What are the dimensions of these deckers: (I believe they are simple open deckers) and what is your facing wire mesh?

A. Yes, they are open deckers of diameter 60 inches and face length 240 inches. We use a wire mesh of 60.

Q. What do you think of side hill screens for washing?

A. We prefer to use deckers.

Q. How do you handle the concentrated ink effluent?

A. The first filtrate is clarified and then pressed out on a belt thickner to a consistency of about 35% and this is used as a land fill.

Deinking Chemistry

The deinking chemistry used at FSC Corporation is the proprietary of MEDIA GENERAL INC, who are the present owners of GARDEN STATE PAPER COMPANY. Information regarding chemicals used and operating conditions for this chemistry are not disclosed.

If someone is interested in getting the knowhow, Media General Inc. are willing to discuss this matter with the interested party.

SOUTH EAST PAPER MANUFACTURING COMPANY

DUBLIN, GEORGIA

(A Joint Venture of Knight Ridder Newspapers Inc.
Cox Enterprises Inc. and Media General Inc.)

Date of Visit - Sept. 21, 1981

Mill Data

Pulp Mill

Type of Pulp - Deinked Pulp
TMP

Capacity - Deinked Pulp 535 TPD
TMP 100 TPD

Equipment used -

1. Bucket with electric hoist to feed pulper
2. Three batch pulpers feeding into a single continuous pulper
3. Trash screen for continuous pulper during flushing
4. High density cleaners
5. Horizontal presses with predrainer
6. Deflakers
7. Johnsson screens for primary stage
8. Johnsson screens for secondary stage
9. Decker washers arranged for three stage counter current washing

Paper Mill (Consisting of one machine)

Capacity - Av. designed production 450 TPD
Av. actual production 480 TPD

Type of machine - Belbaie II (Twin wire)

Width - 330"

Speed - Maximum designed 3 500 FPM
Current operation 3 300 to 3 400 FPM

Fiber Furnish - 100% deinked pulp from waste news

Interview with Mr. Frank Newman and Kenneth Ross

Mr. Frank Newman is one of the senior executives of the company. He was actively connected with the project during construction. He now holds the position of operation and services manager. Mr. Kenneth Ross is also one of the senior executives of the company and has been with the mill through the phases of construction, start up etc. He now holds the position of pulping manager (recycling).

Waste News Collection and Quality Requirements

Q. How much recycled fiber are you using in the fiber furnish?
A. We are using 100% recycled waste news fiber.

Q. What are your problems in collecting waste news for your mill?
A. Collection is not a problem to us.

Q. Do you have any quality problems?
A. Yes, this is our major problem in the raw material supply area. We get non pulpable materials mixed with the waste news. Sometimes these materials are used by the publisher for purposes of newspaper advertisements. For example, last week we got insurance cards printed in plastic and enclosed with the daily newspaper. We also have problems with splicing materials that that are not pulpable.

Q. Do you tolerate magazines printed with coated paper?
A. This is not a problem for us if they are not in excessive quantities. We generally follow the P.S.A. (Paper Stock of

American standard which allows contaminants up to 1/4 of 1% as magazines, phone books etc.

Q. How does offset printed newspaper affect your recycling process? Do you have to be selective in your treatment between letterpress and offset?

A. Our system of recycling process could operate both on letterpress as well as offset with no changes to the process system.

Q. Do you have any system of check on the incoming raw material for quality?

A. Yes, we inspect one bale per truck load and 2 bales per rail car.

Q. Do you check for moisture on the incoming raw material?

A. Yes, we reject it if moisture is in excess of 15%.

Q. What are the steps you have taken to collect your raw material most efficiently?

A. We collect our raw material through SOUTH EAST RECYCLING CORPORATION which is an affiliate of SOUTH EAST PAPER MANUFACTURING COMPANY. We have established collection centers in areas such as Atlanta, Montgomery, New Orleans etc.

Q. Waste paper prices are normally subject to high price fluctuations. What is your experience in this respect?

A. The price of waste news has been quite stable for the last 3 years.

Q. Do you think this method of holding a buffer stock is helpful to stabilize prices?

A. Yes, this is helpful.

Q. I note you are building a good warehouse for paper storage. Why cannot you continue to store waste news outside as before?

A. Both sunlight as well as excessive moisture are not helpful for the deinking process.

Q. What is the time you allow for storage of waste news without adversely affecting the quality of the newsprint produced?

A. In the north of USA they allow 2 to ? years but here in the south this has to be 1 to 1 1/2 years i.e. one year for plastic cover storage and 1 1/2 years for warehouse storage.

Q. What do you consider an economic distance to collect waste news for your mills?

A. At present we go as far as New Orleans which is about 700 miles.

Deinking Plant

Q. What type of pulpers are you using; batch or continuous?

A. Our system of pulping consists of 3 batch pulpers that empty into a single continuous pulper. The retention time in each batch pulper is 20 mins.

Q. Why do you have this system of a combination of batch and continuous pulpers?

A. By using the batch pulper our dosage of chemicals to the raw material could be better controlled. Each batch pulper is loaded using a bucket. The bucket has a quick tipping door for discharge of waste news into the pulper. It is also fitted with a load cell. By using the load cell we could load the pulper to a predetermined weight per each pulper batch. The continuous pulper completes the defibering and removes the contaminants such as plastics and stringy materials.

Q. What are the special features of the pulpers you are using in your mill and what is the optimum consistency?

A. For the batch pulper we are using the BELOIT SHARK type pulper and for the continuous pulper we are using the EDGE WALL BOARD type pulper. The edge wall board pulper has special features to prevent the clogging of the pulper screen plate. This is achieved by vibration membranes fitted to the pulper side walls that gives a

pulsation effect and prevents the pulper plate getting blocked with plastic materials. The batch pulpers are not fitted with extraction plates and they dump the stock after defibering and treatment with the deinking chemicals into the continuous pulper. The optimum consistency for our pulpers is 5 1/2%.

Q. I noticed a screen located underneath the continuous pulper. What is the purpose of this screen?

A. We flush out the continuous pulper 2 times per shift to remove all the trash trapped inside the pulper. This screen will reject all the plastic and other contaminants in the paper stock that have not passed through the pulper screen plate. The accept from the screen, which is mainly the fibrous stock, is fed back into the continuous pulper.

Q. What is the retention time in the dump chest that is located immediately after the pulper?

A. The retention time in this chest is about 10 minutes.

Q. What follows the pulper dump chest?

A. We have high density cleaners followed by Beloit - Jones horizontal press equipped with predrainer. From the horizontal press we deliver the stock to deflakers designed to work at 4 1/2% consistency. After the deflakers we have the Johnsson screens arranged in 2 stages, primary and secondary. The primary accept is sent to the decker washers and the primary reject is screened on the secondary Johnsson screens where the reject is sewered and accept fed back to the pulper dump chest. The stock from the decker washers goes after washing to the machine chest.

Q. What type of deckers are you using and how many stages and what mesh are you using on the facing wire?

A. We are using simple open deckers in 3 stages with a 60 mesh wire.

Q. For your current production of about 480 tons of newsprint working on 100% recycled fiber you will require several lines of washers. What is the width and diameter of these decker washers?

A. We are using 240" face length 60" diameter washers and as stated before it is in 3 stages and we require 8 such lines for the above production.

TMP Pulping

Q. Since you are using 100% recycled fiber for making newsprint, why did you install a TMP mill?

A. Originally we planned to use about 15% TMP but we found there was no need for it. Now that we have the TMP mill we are developing this process as an experimental measure to gain certain paper characteristics in case the market requires at some stage or other.

Water Steam and Power Requirements

Q. How much water are you currently using per ton of deinked pulp?

A. About 9 000 gals per ton.

Q. How much steam do you use per ton of deinked pulp?

A. We use very little steam for our deinking operation.

Q. Do you think deinked paper drying on the machine requires less steam compared with virgin pulp fiber?

A. We do not have any data on this subject.

Q. How much water do you require for the whole mill based on a ton of newsprint?

A. The same figure as before (9 000 gals/ton) since we recycle the paper machine water in the pulp mill.

Q. What is your electric energy requirement for the whole mill based on a ton of newsprint production?

A. This data is not available at present.

Q. How much electric energy is saved by recycling waste news compared to a virgin fiber mill using the TMP process?

A. We are of the opinion a TMP mill may require electric energy 2 1/2 times higher than a deinked mill, but remember there is some energy needed to produce the chemicals that are needed for deinking.

Paper Machine Operation with Deinked Waste News

Q. What is the maximum speed you have achieved on your machine using 100% deinked pulp?

A. We have operated our Belbaie at 3 400 FPM and this is a good speed considering we started up this machine only in June 1979. We are now getting close to the limits of the machine drive capacity, therefore we are thinking of rebuilding the drive, so that the machine could be speeded up further at a future date.

Q. Do you experience any problems with foam?

A. We have no problems with foam.

Q. Is your machine equipped with a deculator.

A. Yes, we have a deculator on our machine.

Q. Do you experience problems with felts getting dirty and getting plugged with fiber fines and ink particles etc?

A. No, we do not have such problems.

Q. What is the life of your felt in the 1st position which I believe is a combination of both pick up and 1st press?

A. We get about 40 days in this position.

Q. What is the cleaning arrangement you have for the 1st position felt?

A. We have UHLE boxes and high pressure showers. We did have Vickery shoes but we took them out.

Q. What is your first pass fiber retention?

A. We get about 40% to 45% retention on the first pass. It is possible for us to improve this figure by use of chemical additives.

Q. Repeated recycling should have some adverse effects on strength properties and runnability. Do you notice this in machine operation?

A. No, we have not noticed any difficulties in this respect.

Q. You mentioned earlier that you had a successful start up and are presently operating close to the maximum designed speed using 100% recycled news. What are the features on the machine that have been helpful to you for this success?

A. We are happy with the Belbaie forming section and the TRI nip press system and these features have been helpful to achieve better runnability.

Q. I am told recycled newsprint made on your Belbaie does not have linting problems compared to recycled newsprint made on Fourdrinier machines. Is this correct?

A. Yes, the Belbaie forming system reduces the linting problem considerably.

Q. I notice you have a breaker stack and you are not using it.

A. We find it is possible to skip the use of the breaker stack. By skipping the breaker stack we have reduced the down time due to breaks at this point.

Q. How fast do your printers run your paper?

A. About 80 000 copies per hour.

Deinking Chemistry

Details of the deinking chemistry of this mill are not available for discussion. The usage rights could be however purchased from MEDIA GENERAL INC explained under Garden State Paper Mill, Garfield (N.J.).

SOUTH EAST RECYCLING CORPORATION

ATLANTA, GEORGIA
(A Subsidiary of South East Paper Company)
Dublin, Georgia
Date of Visit - Sept. 30, 1981

Key Personnel Contacted

Mr. JOHN EVANS - Manager Loose Buying Centers
Mr. JOHN HANSON - Manager (Atlanta, New Orleans, Montgomery etc)

Interview with Mr. John Evans

Q. What is your annual requirement of waste news for S E Paper Company?
A. We require 180 000 tons per year.

Q. How successful is your recycling campaign in Atlanta?
A. We are able to recycle about 50% of all the waste paper consumed in the Atlanta area.

Q. How much is waste news as a percentage of all the waste paper collected by your company?
A. The waste news is about 35% of all the waste paper we collect. It is reasonable to assume about 30% of the newspapers circulated in a particular area could be collected as waste news for recycling.

Q. What are the other competitive uses for waste news?
A. We have other uses as insulation material and for toilet tissue manufacture.

Q. Now that you have a separate agency for the recycling business known as S E Recycling Corporation, are you collecting all your requirements directly from the consumers?

A. Our major suppliers are waste paper dealers and they supply 70% of our requirements. In addition we have special contracted supply amounting to about 25%. Then the balance 5% is our direct collection from the consumers through various centers in Georgia and around Georgia.

Q. Where are your collecting centers operating at present?

A. We have centers in Atlanta, of course, followed by Savannah (Georgia), New Orleans (Louisiana), Montgomery (Alabama) and Lakeland (Florida).

Q. For your direct collection, do you work through voluntary organizations such as churches etc?

A. Yes, in addition to church groups we have schools as well as individuals bringing paper to our centers.

Q. I am told some collecting agencies encourage kids to participate in recycling programs by having special campaigns over a weekend. They station themselves near departmental stores and give coupons instead of money to purchase whatever kids fancy buying. I hear this has a good effect as it gets kids involved into the habit of collection for recycling.

A. Yes, we do find it very helpful. In fact we have a program where we say "RECYCLE - CYCLE". This means they can get a bicycle free of cost by participating in our recycle program.

Q. How much do you pay for 100 lbs of waste news collected at your centers? If this price is not attractive enough it may not be worth all the trouble, including the high price of gasoline intransporting waste paper to your centers by these small voluntary groups and individuals?

A. At present (Sept. '81) we are paying $1 00 per 100 lbs or $20. per ton delivered to the collecting centers.

Q. The mills are not happy with magazines, kraft paper bags, plastic materials etc. getting into the recycling system for newsprint deinking. Do you find it necessary to sort out these materials?

A. Yes, we do it at some of the large centers like Atlanta and New Orleans where we try to separate these materials collected from households.

Q. Since labor is expensive, have you mechanized this sorting to some degree?

A. We have to, of course, still use people to sort out the above contaminants. What we have provided is a slow moving belt where the trucks dump the waste paper and then as the conveyor moves slowly, people are supposed to pick out these materials. The conveyor at the final stage, discharges into the baler where the waste news is baled.

Q. What is done with the magazines and kraft grades?

A. We sell them to the paperboard mills.

Q. What is the average cost of waste news delivered to mills, taking into consideration baling, sorting, transport etc?

A. Today (Sept. '81) the price delivered at the mills averages $ 77 per ton of waste news.

Q. Could you give a rough breakdown of the cost?

A. This will vary quite a bit depending on the centers, but roughly it is as follows:

- The average price at collecting centers is about $50 to $55 of which $20 is the cost of sorting and baling.
- The average cost of transport would be between $15 to $20.

Both added together will work out to about $77 per ton.

Q. I am interested in the employment potential of collecting, sorting, baling and handling waste news to mills. Do you have some data available?

A. Say, for example, at the Atlanta center we need 15 men to handle 3 000 tons per month. In other words, it is about 200 tons per person per month.

Q. How much of the waste news collected for recycling centers are over issues and printers' waste?

A. This is approximately about 10%.

Q. One serious problem in waste paper usage is price fluctuation. I understand it is necessary to carry some inventory to avoid such shocks. How much inventory do you carry?

A. We carry about 3 months supply.

PUBLISHERS PAPER COMPANY

OREGON CITY, OREGON

Date of Visit - August 7, 1981

A Subsidiary of Times - Mirror Co.

Mill Data

Pulp Mill

Type of Pulp and Capacity

- 1. Sulphite pulp mill (magnesium base) 230 tons/24 hrs - 6 batch digesters
- 2. RGWP 250 tons/24 hrs using 9 Bauer (double disc refiners)
- 3. TMP 175 tons/24 hrs. using one Jones 60" 8 000 HP (primary) and one Jones 48" 5 000 HP (secondary) one Bauer No. 480 (tertiary)
- 4. Deinked pulp 120 tons/24 hrs

Paper Mills (total 4 Fourdrinier machines)

Capacity of 4 machines - 660 TPD

- 1 machine - 115" width, 104" trim - 1 600 FPM
- 1 machine - 118" width, 107" trim - 1 350 FPM
- 1 machine - 136" width, 122" trim - 2 450 FPM
- 1 machine - 234" width, 222" trim - 2 500 FPM

Key Personnel Contacted

Mr. ZEN F. ROZYCKI - Corporate Technical Services Coordinator

Mr. PERRY JORGENSON - Technical Director

Miss JANET MALLOCH - Engineer, Technical Department

Equipment Used for Deinked Pulp Production

1. Pulper with conveyor feed
2. Inclined screw presses (extractors) - VOITH make in two stages, primary and secondary
3. Johnsson screens (primary)
4. Himac pressure screen (secondary)
5. Reject screen (Johnsson) for primary position
6. Impco vacuum washers

Deinking System

A batch pulper is used for pulping and the waste news is conveyed to the pulper by a slat conveyor. Each batch takes about 10 minutes and the necessary chemicals for deinking are added to each batch. The filling and emptying takes about 10 minutes, and a full cycle is therefore 20 minutes. The water added to the pulper for pulping is raised to a temperature of 130°F (54°C). A ragger and junk remover is used on the pulper to remove the trash during the pulping operation.

The stock is discharged from the pulper into a dump chest at the end of each batch. From the dump chest the stock is then delivered to inclined screw presses or extractors arranged in 2 stages (primary and secondary) with an intermediate mixing tank. The inlet and outlet consistency for the inclined screw presses is 4% and 12% respectively. After the screw press, washing the stock is screened in 2 stages. The primary screening is done on Johnsson screens which act as the coarse screen and the secondary screening is done on a Himac screen which is a pressure screen. The reject from the primary coarse screen is mainly twines and plastic materials. The pressure screen reject contains useful fibrous materials along with contaminants and is therefore handled on a reject vibration screen. The accepts from the reject screen is recycled back. The primary coarse screen operates at 2.5% and the secondary pressure screen operates at 1.5% consistency.

The stock after fine screening in the Himac pressure screen is delivered to an Impco vacuum washer. The inlet consistency for this

washer is 1.1% and outlet 12%. From the vacuum washer the pulp is discharged into a high density storage tower. The stock from the high density storage tower is delivered to the paper mill at 3.5% consistency. A brightening agent known as V. BRITE by trade name, consisting essentially of sodium hydro sulphite, is added to the inlet of the pump delivering stock to the paper mill. This improves the brightness from 48 points to 54 points on the ELPHRO scale. The brightening agent used amounts to about 12 to 14 lbs per ton of pulp.

Improvements Considered to the Existing System

CAPACITY - Deinking capacity would be increased from 120 TPD to 175 TP to use more of deinked pulp and less of sulphite pulp.

PULPER - The new system would be provided with a continuous pulper in place of a batch pulper.

PRIMARY SCREW PRESS FILTRATE - The filtrate from the screw press would be subjected to a floatation process system to separate the useful fiber from the ink. The floatation process system is marketed under the trade name WEMCO.

DECKERS - The IMPCO vacuum washer would be replaced by a disc filter.

PRESSURE SCREEN - The HIMAC pressure screen would be replaced by a BLACK CLAWSON selectifier due to frequent jamming experienced on HIMAC screens on account of plastics, twines, etc.

Interview with Mr. Zenon F. Rozycki

Corporate Technical Services Coordinator

The deinking chemistry used by the PUBLISHERS group was developed by Mr. Zenon F. Rozycki. The PUBLISHERS group have the rights of ownership to the deinking formula.

Q. What is the average deinked pulp content of PUBLISHERS newsprint?

A. Newberg Mill - 25% (av.)
Oregon City Mill - 25% (av.)

Q. What are the limits for PUBLISHERS CO. increasing the percentage and what do you consider as the maximum possible usage at Newberg and Oregon City Mills?

A. We have done trials using 100% deinked pulp; but commercially our company would consider a maximum of 35% to 40% deinked pulp of the total fiber furnish.

Q. Is PUBLISHERS deinking system based on the same chemistry as GARDEN STATE MILLS?

A. No, we developed our own formula.

Q. Who are the process owners and licensees of your system?

A. The process formula was developed by myself (Zenon F. Rozycki) but at present the ownership rights belong to the PUBLISHERS group.

Q. How do you compare the deinked pulp energy requirement at PUBLISHERS with TMP production?

A. TMP requires about 1 800 to 2 200 KWH per ton.
Deinked pulp requires about 360 KWH per ton.
(You could therefore see there is much savings in energy by using deinked pulp.)

Q. What is the heat requirement per ton of deinked pulp?

A. We are using back water from the paper machine in the pulper. Therefore, our heat requirements for deinking is very little.

Q. Do you make any difference in the dispersion chemistry between newsprint waste made with different fibrous stock (i.e. Douglas Fir, Hemlock, Spruce, etc.)?

A. No, we do not make any difference.

Q. How does offset newsprint ink removal differ from letter press ink removal?

A. Offset deinking formula is slightly different to letter press deinking formula. At present 75% of our waste contains offset newsprint waste and we have no problems working only with the offset newsprint formula.

Q. What is the effect of alum present in the paper machine back water?

A. Alum is not helpful for deinking and at PUBLISHERS we do not use alum for any process. We tried a clarifier that needed alum to help sedimentation and we ran into problems. Therefore we have discontinued the use of this clarifier.

Q. If alum is not at all used in the paper making process, how do you handle, for example, pitch problems?

A. To disperse pitch and resin we use a product marketed under the trade name MISTRON VAPOUR. This is distributed byVAN WATERS AND ROGERS.

Q. What is the effect of calcium, magnesium and iron?

A. These are not helpful in deinking.

Q. Since your production of sulphite pulp is based on magnesium, how does this affect the quality of newsprint produced by blending deinked pulp with sulphite pulp?

A. Our sulphite pulp is well washed and there is very negligible magnesium in the pulp.

Q. Are you using any chelating agents?

A. We will not disclose this information.

Q. What is the effect of deinked pulp on felt life such as plugging?

A. We have some problems with felt plugging, but it is not serious. It is however important to control the deinking operation, to avoid such problems.

Deinking Chemistry

The deinking chemistry used by PUBLISHERS is the proprietary of PUBLISHERS COMPANY. Information regarding chemicals used and operating conditions for this chemistry are not disclosed.

If someone is interested in getting the know how PUBLISHERS PAPER COMPANY are willing to discuss this matter with the interested party.

ONTARIO PAPER COMPANY

THROLD, ONTARIO, CANADA

(A Subsidiary of Tribune Co.)

Date of Visit - August 21, 1981

Mill Data
(Before Modernization
and Existing Mill)

Pulp Mill

Type of Pulp and
Capacity - 1. Sulphite pulp mill (sodium base) 240 tons/24 hrs of which 75 tons is market pulp. Batch system of cooking (4 digesters)

2. SGWP 400 tons/24 hrs using 15 continuous Robert grinders

3. RGWP 55 tons/24 hrs
one 4 000 HP and one 2 000 HP BAUER
one 500 HP Impressafiner

Paper Mill (total 5 paper machines all Fourdriniers)

Capacity of 5 machines - 220 000 tons per year

- 2 machines - P and J width 167" trim 183"
speed 1 600 FPM
- 1 machine - B and S width 167" trim 150"
speed 1 600 FPM
- 2 machines - P and J width 167" trim 150"
speed 1 600 FPM

Mill Data

(After Modernization)

Pulp Mill

Type of Pulp and Capacity

1. Sulphite pulp 170 tons/24 hrs
2. Chemi-Mechanical pulp 180 tons/24 hrs
3. TMP 320 tons/24 hrs.
4. Deinked pulp 230 tons/24 hrs

TOTAL: 900 tons

Paper Mill (consisting of 2 machines)

The above 5 Fourdrinier machines will be retired and would be replaced by 2 twin wire BEL-BAIE machines.

Type
- BEL-BAIE II
- Trim 300"
- Speed 4 000 FPM (designed) or 310 000 tons per year

Capacity - 950 to 1 000 tons/24 hrs (2 machines)

Key Personnel Contacted

Mr. J. T. DAVIS - Assistant Vice President (Operations)

Mr. H. P. RICHARDS - Director (Recycling)

Proposed Production of Deinked Pulp

At the time of visit the deinking pulp mill and the new paper machines were under erection.

The process system, based on Beloit technology for the deinking of waste news, is as follows:

The waste news would be fed into batch pulpers by means of a mono rail electric hoist, using a steel rectangular bucket with a quick discharge flap. After chemical and mechanical

treatment the fibrous stock would be discharged to a continuous pulper located directly below the batch pulper. From the continuous pulper the stock would be fed into high density cleaners. The high density cleaners will then discharge the stock into a dump chest. The stock from the dump chest would be pumped through BELCOR cleaners. The reject from the BELCOR cleaners would be sent over a vibration screen, and the accepts from the screen would be recycled into the continuous pulper, whereas the reject would be collected in trash bins. The accepts from the BELCOR cleaners would be delivered to the 1st stage Beloit horizontal press washer. From the press washer the stock is discharged into the 1st stage soak tank. From the soak tank the stock is pumped to pressure screens arranged in 2 stages (primary and secondary). The primary accepts are delivered to decker washers whereas the rejects are sent to secondary pressure screens. The accepts from the secondary screens would be recycled back into the 1st stage soak tank whereas the reject would be directed to a reject flat screen to reclaim the useful fiber. The washed stock from the decker washers would get discharged into a soak tank. From the soak tank the stock would be pumped to the 2nd stage press washer similar to the 1st stage. The pressed out stock would then be received in press tanks immediately after each press. To achieve better uniformity, the stock from the different presses (total 8 presses) would be blended together in a blending tank that is located after the press tanks. The unbleached stock is then ready for bleaching.

The bleaching would be done in a hydro-sulphite bleaching tower. After the bleaching, the pulp would be delivered to the paper machine chest.

Interview with Mr. H. P. Richards

Director of News Paper Recycling

Q. What is your present production and what will be your production after modernization?

A. Our current production is 220 000 tons/year of newsprint on the existing 5 Fourdrinier machines. After modernization we will produce 310 000 tons/year on the 2 BEL-BAIE twin wire machines.

Q. I believe you are going to use deinked pulp only as part of the fibrous furnish; what is then the fibrous breakdown of your proposed newsprint?

A. The proposed newsprint will have approximately the following composition:

TMP	- 36%
CMP	- 20%
Sulphite	- 19%
Deinked pulp	- 25%

Q. I understand you are the first newsprint mill projected for deinked pulp production in Canada. Why is this change necessary?

A. We have "wood limits", that is to say we are restricted on wood supply to satisfy only the existing capacity of 220 000 tons of newsprint per year. When we now expand to 310 000 tons per year, we will have to look for alternative sources of supply other than wood.

Q. When other mills are successfully operating with 100% deinked pulp, why did you not plan on increasing the use of deinked pulp from 25% to 50% and reduce CMP and sulphite pulp?

A. We are planning to use CMP because we have the availability of poplar wood and a sulphite mill already here in operation. In other words we have just planned it on available resources of raw materials and on existing facilities.

Q. How far will you go to collect your waste news?

A. About 200 miles

Q. Will you use old telephone directories for recycling?

A. No

Q. How much storage have you allowed at the mills?

A. 3 months

Q. What is the cost of baling waste news?

A. It would cost about $10 to $15 per ton.

Q. How much do you pay for waste news delivered at collection centers?

A. We pay about $45 to $50 per ton.

Q. How much does it cost to transport to the mills?

A. This of course depends on distance, but on the average this could be $25 per ton.

Q. Will you have a breaker stack on your new machine?

A. No

Q. What type of press configuration will you have on the new machines?

A. Tri nip press designed for 500, 600 and 700 pli.

Deinking Chemistry

The deinking chemistry proposed to be used at ONTARIO PAPER COMPANY is the proprietary of BELOIT JONES CORPORATION. Information regarding chemicals and operating conditions for the chemistry are not disclosed.

If someone is interested in getting the know how, BELOIT JONES CORPORATION are willing to discuss this matter with the interested party.

BELOIT DEINKING SYSTEM

The BELOIT CORPORATION, BELOIT, WIS. U.S.A. are leading manufacturers of paper machines as well as pulp and paper mill equipment. In 1972, the BELOIT management, in order to meet the demands of the paper industry in the use of secondary fiber for paper making, initiated a program to develop an economical, high consistency deinking process. The chief objectives of this development program are as follows:

1. Water consumption less than 5 000 gals/ton.
2. Minimum effluent discharge and improved effluent quality to satisfy strict environmental standards.
3. Fiber loss, less than 7%.
4. Reduction of chemicals and heat requirements.

Based on the above development Beloit Jones Division, Dalton, Mass., U.S.A. is now supplying complete deinking units as well as selected pieces of equipment tc deinking mills around the world.

Key People Contacted

Mr. WILLIAM V. STEVENS - Manager, Sales

Mr. ROBERT HORACEK - Senior Research Engineer

Mr. JL SIMON - Customer Service

Interview with Mr. Robert Horacek
Senior Research Engineer

Q. The principle of high consistency deinking and reduced water consumption with consequent reduced effluent is quite attractive for mills. Where are these mills in operation?

A. We are currently supplying complete deinking plants to two mills:
- ONTARIO PAPER THROLD, ONTARIO, for 265 tons/24 hrs
- SOUTH WEST FOREST INDUSTRIES, ARIZONA, for 350 tons/24 hrs

The ONTARIO deinking mill will start on October 1981 and the SOUTH WEST mill, will start on December 1981. We have supplied Beloit equipment to the SOUTH EAST MANUFACTURING CO, DUBLIN, but it is not our technology. The VAN GILDER, RENKUM mill in HOLLAND is using our technology.

Q. When you say 5 000 gals of water per ton, is this on the basis of newsprint mills using 100% recycled fiber?

A. Yes, it is feasible for deinking mills to work on 5 000 gals. per ton of deinked pulp production. In fact, the Van Gilder Mill in Holland is working with our deinking system on 1 500 gals. per ton of deinked pulp.

Q. What about fiber loss; you have claimed only a loss of 7%? Is this practical when you are using 100% recycled waste news to make newsprint? I am thinking of problems such as drainage on the wire, runnability on the machine, felt plugging with fiber debris and fines. It is claimed it is better to let off part of the fines to avoid the above problems.

A. With our system of high consistency operation and reduced discharge of effluent it is even possible to lower the losses to 5%, but from an operating point of view it is left to the client to choose the optimum point depending on factors you have mentioned earlier - such as drainage on the wire, and whether deinked pulp is used as part of the furnish or 100% of the furnish.

Q. For mechanical dispersion of ink, what type of pulper rotor and deflakers would you recommend and what are the optimum consistencies?

A. When we talk of only newsprint mills there is very little mechanical dispersion required. Grades such as ledger waste, requir. mechanical dispersion.

BATCH PULPERS

In the case of pulper rotors we have developed a rotor known as DOLPHIN. This is recommended as it cuts down power requirements. It is also possible with this rotor to work at high consistencies of 9 to 9 1/2%. There is, of course, a limit to high consistencies and the desirable consistency is between 8% to 9% beyond which the interaction of chemicals will not be so good.

Note: The choice of optimum consistency will depend on individual cases. The above Dolphin rotors are for batch pulpers and the Dolphin is not effective below 6%.

CONTINUOUS PULPER

The continuous pulper, which would be a conventional type, would normally have to operate at about 3 1/2%. This consistency is recommended for the ragger to be effective in removing the trash material.

DEFLAKER

The deflakers used by Beloit are of the conical type with wide tackles to prevent cutting. They are recommended to be located after high density cleaners. When continuous pulpers are in use, it is generally required to use deflakers.

Q. In respect of chemical dispersion I see you are recommending a fine dispersion of about 15 microns. Is this necessary for high consistency washing?

A. Yes, we aim at a particle size of about 15 microns to get good results. Fine dispersion is the key to maximum ink removal by any washing device.

Q. What is the temperature you would recommend for the chemical reaction during deinking?

A. The brightness is better at higher temperatures. We find the surfactant works better at 120°F, and this is recommended.

Q. What PH do you recommend for the deinking chemical reaction?

A. The best results are obtained at a PH of 9 to 9.5 if bleach is added to the pulper. Otherwise this could be a PH of 8.5.

Q. Regarding bleaching you are recommending hydrogen peroxide. This is rather expensive, the shelf life is poor and it is also hazardous. What is the alternative you would recommend?

A. The other alternative would be sodium hydro sulphite for waste news.

Q. What is the basic deinking formula you recommend?

A. This is not available for discussion, but when a client buys our equipment and technology this is of course made available to the particular client. However the basic principle of deinking chemistry is as follows:

- to remove the ink from fiber without damaging the fiber
- to disperse the ink particles freely in water medium for easy mechanical removal

Q. When a client buys your equipment, do you conduct all the tests that are necessary on this raw material, so that the choice of equipment and the correct deinking formula could be recommended? Are these tests free of charge?

A. Yes, we do these tests for the client so that we could recommend the right piece of deinking equipment and the correct deinking formula. Normally we do not charge for these services.

Q. You mention a retention time of about 40 to 50 minutes for the deinking chemical reaction. How do you get this in practice in your deinking system?

A. This is as follows:

- batch pulper 20 mins
- continuous pulper 3 mins
- dump chest 20 mins

total - 43 to 45 mins

Q. Why do you say vacuum filters are not quite satisfactory for ink removal?

A. The vacuum filters form a tight mat and the filtration is subsequently poor for a good washing effect. They are only good as thickners for the deinking system.

Q. Where are your Beloit press masters operating on 100% recycled fiber newsprint mills?

A. We have them in Dublin, Pomona, Mexico etc.

Q. What is the size of the perforations on the mesh of these press masters?

A. The perforations are o.o23".

Q. How many times can waste news be repeatedly cycled without adversely affecting the properties?

A. About 8 times.

Q. You mentioned earlier that a temperature of about 120°F is favorable for the surfactant to react. What are the other conditions that are necessary for deinking?

A. They are as follows:

- Temperature about 120°F
- Alkalinity 9 to 9.5 PH. Adjustment in PH is possible using caustic soda or sodium silicate for an increase and sulphuric acid for decrease. Never use alum.
- Retention time 40 to 50 mins
- Order of chemical additives - Deinking chemical should be added prior to fiber addition in the pulper. This helps brightness by at least 2 points. The following order is recommended: Starting with water conditioner or chelating agent, followed by alkali, surfactant and bleach
- Water hardness - This is overlooked but it must be remembered iron, calcium and magnesium minerals tend to bind the ink to the fiber and interfere with the deinking chemistry. It is therefore helpful to add a small percentage of chelating agent to tie up these ions.

Q. You mentioned about caustic soda usage to increase the PH, but with ground wood furnishes the tendency for caustic soda would be to react with lignin causing, under some conditions, poor brightness.

A. Yes, this can result in poor brightness and permanent color reversion if deinking PH exceeds 10.3.

Q. I suppose offset newsprint ink is more difficult to disperse due to resin binders compared to letterpress newsprint ink.

A. Yes, with letterpress ink about 1% to 2% surfactant is sufficient to emulsify the petroleum ink vehicle and release the carbon particles. But in the case of offset inks, due to resin binder additives, we found it helpful to use certain grades of sodium silicate with the surfactant. Sodium silicate provides alkalinity and its abrasive nature aids in releasing and dispersing ink particles and this prevents redeposition of ink on the fiber. It must be also noted there are several grades of sodium silicate which depend on the molecular ratio of sodium oxide to silica. These differences affect the deinking efficiency significantly.

Q. You mentioned the basic principle of deinking chemistry is the removal of ink from the fiber followed by dispersion of ink particles in a water medium to enable mechanical removal. Now there are two well known systems:

- floatation
- washing

I know Beloit deinking system is mostly engineered with washing system. Could you explain why you favor the washing system?

A. The washing system is a purely mechanical operation and once the stock leaves the pulper it is not subject to chemical upset. On the otherhand, the floatation system has disadvantages. Chemical costs are significantly high. Freeness, tensile, tear, burst, bulk and brightness are all lower. Although yield is slightly higher with floatation, because the fines are not removed, the overall pulp quality is inferior because of it. A major disadvantage is the poor capability of the system for ash removal

and this is an important requirement for types of waste mixed with coated grades and heavily filled papers. We feel high consistency washing has distinct advantages but in a situation where large particles are present (i.e. larger than 15 microns in diameter) it is not possible to completely remove such particles by high consistency washing. For this purpose lower consistency washing devices would be required. Our system design will therefore employ low consistency devices combined with high consistency presses.

Our research efforts at Beloit indicate about 80% of the available deinking furnish can be processed effectively by washing systems and we are therefore concentrating on washing techniques.

Q. In respect of washing devices used in deinking mills, I see the following types are in use. Could you discuss their merits?

- side hill screens
- deckers (open type)
- inclined screws (extractors)
- screw presses both horizontal and vertical

A. Side hill screens

Advantages
- low capital cost
- operation without power
- efficient in ash removal from heavily filled waste

Disadvantages
- high water consumption
- high effluent consistency
- high fiber losses
- require large amount of space

Deckers (open) gravity type

Advantages
- low effluent solids
- overall water consumption is low
- fiber loss is much lower than side hill screens

Disadvantages
- high capital cost of the units

Inclined screw extractors

Inclined screw extractors are inclined at an angle of about 60° from the horizontal. Typical inlet consistencies are 1 to 3% and outlet 8 to 10% for newsprint.

A 9 inch diameter screw will have a capacity of about 15 to 20 TPD on newsprint stock and is powered by 5 to 7.5 HP motor.

Screw presses

Beloit press masters are available both in horizontal and vertical design. The newer design is mostly the horizontal type. A pre-drainer could be fitted to the horizontal press to give an infeed of 8% to 9% consistency to the press which will increase the overall capacity of the press. A horizontal press could discharge at a maximum consistency of 35%, but 24% to 28% is normally recommended.

Advantages
- low water consumption
- low effluent discharge and relatively low effluent solids
- relatively low fiber loss
- minimum space requirements

Disadvantages
- high power consumption
- high capital cost

Q. In terms of economics how do you compare the above washing devices?

A. From an economic point of view it is desirable to operate a deinking process at the highest possible consistency within the limits imposed by the dispersibility of the ink. When washing devices are operated at the highest possible consistency, the washing produces very small volume of concentrated effluent making clarification and closed loop operation very practical.

A comparison of costs for the various systems is as follows:

*CAPITAL COSTS (Based on 100 TPD capacity and 99.9% theoretical efficiency)

1.	Side hill washing Complete deinking plant from pulper to end of washing with 5 washers 12' x 25' wide and 3 stages	$ 358,266.00
2.	Decker washing Complete deinking plant from pulper to end of washing with 4 deckers 60" x 240"	753,648.00
4.	Screw extractor washing Complete deinking plant from pulper to end of washing with 36 units of screw extractors of 9" diameter	600,420.00
5.	Press washing Complete deinking plant from pulper to end of washing with 6 units of 18" horizontal presses	569,277.00

**OPERATING COSTS For 100 TPD capacity deinking plants

(Includes energy and fiber loss costs)

	Annual costs on news grade
- Side hill screen deinking plant	$ 924,350.00
- Deckers (open)	348,600.00
- Screw extractors	327,600.00
- Screw presses	183,400.00

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* A breakdown of the above costs, the flow system and the deinking units used are shown at the end of this report.

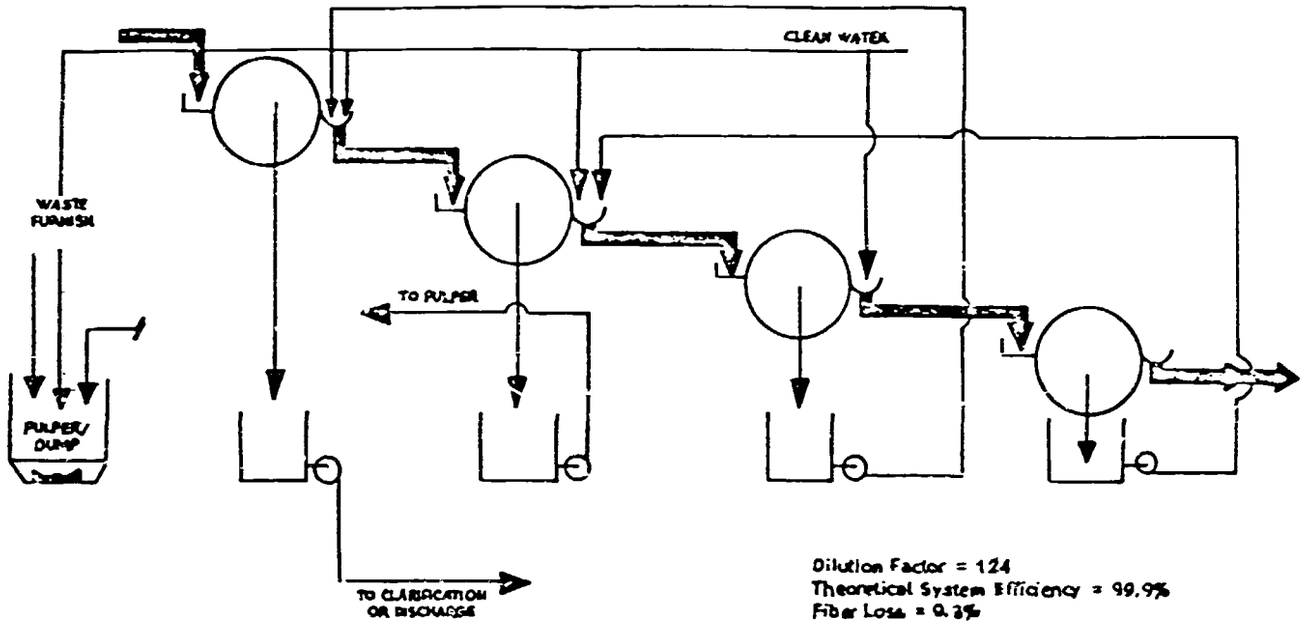
** A detailed breakdown of the above costs is given at the end of this report.

Q. From the above comparative costs I see there are definite advantages to go in for the screw press washing system.

A. To summarize, the waste paper deinking system has to be engineered depending on the type of waste furnish and the end product. The equipment and the deinking chemistry must be matched to each specific application. High consistency washing is one of the several alternatives but it is desirable to deink at as high consistency as possible.

Deinking Chemistry

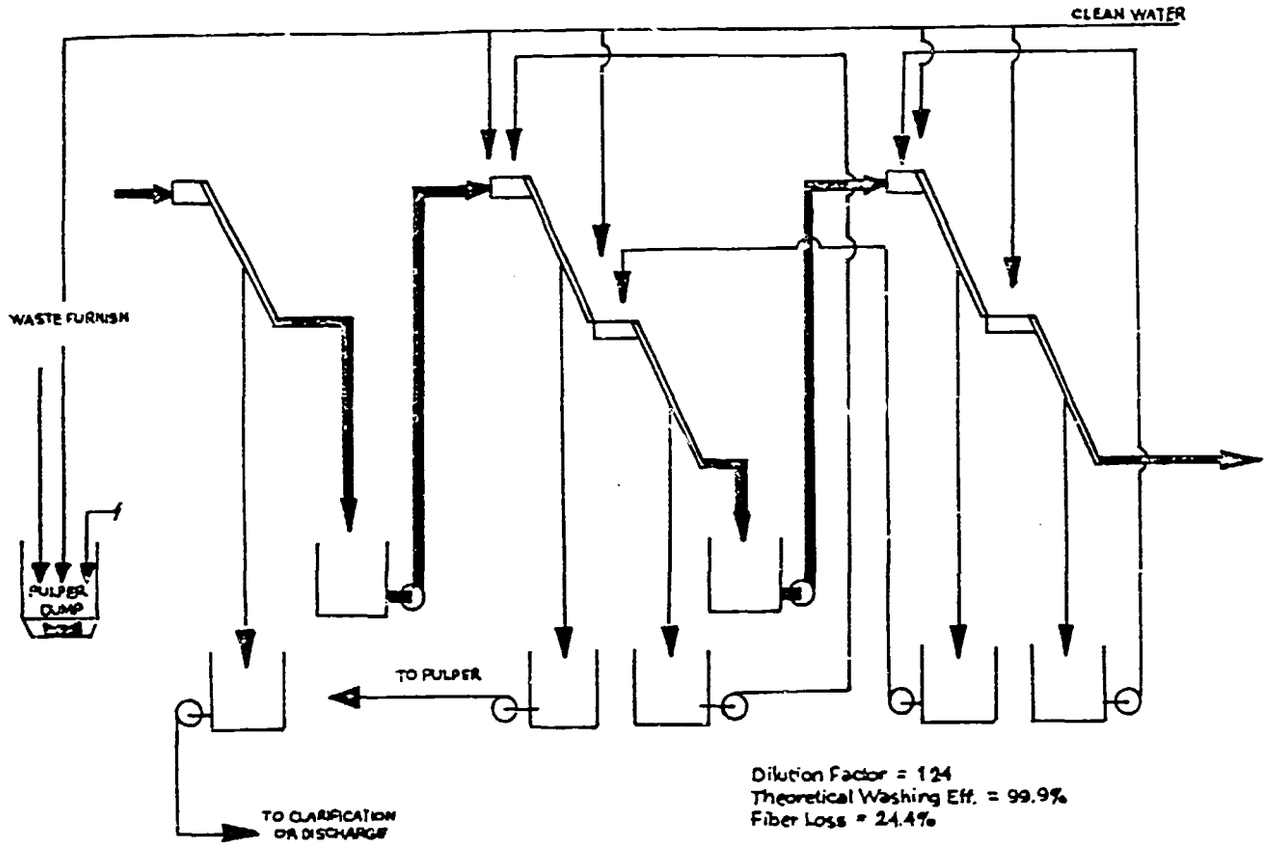
Beloit Corporation is willing to give its know how on deinking chemistry and conduct tests in their research laboratory to match equipment and deinking chemistry to suit the type of waste furnish and the end product to be produced. Interested clients could contact Beloit Jones Corporation, Dalton, Mass. 01226 U.S.A.



DECKER WASHING - 100 BDT/D

	QUANTITY	COST (per Unit)	TOTAL
Washers	(4) 60" dia. x 240"	$155,000.	$620,000.
Drives	(4) 25 hp.	420.	1,680.
Feed Chest	(1) 20.3' d. x 18.6'	21,500.	21,500.
Agitator/Drive	(1) #25, 30" dia., 20 hp.	3,807.	3,807.
Effluent Chests	(4) 14.9' d. x 14.5'	13,750.	55,000.
Agitator/Drive	(4) #25, 25' dia., 10 hp.	3,699.	14,796.
Feed Pump	(1)	8,174.	8,174.
Drive	(1) 100 hp.	2,083.	2,083.
Effluent Pumps	(4)	5,511.	22,044.
Drives	(4) 75 hp.	1,641.	6,564.
Total			$753,648.

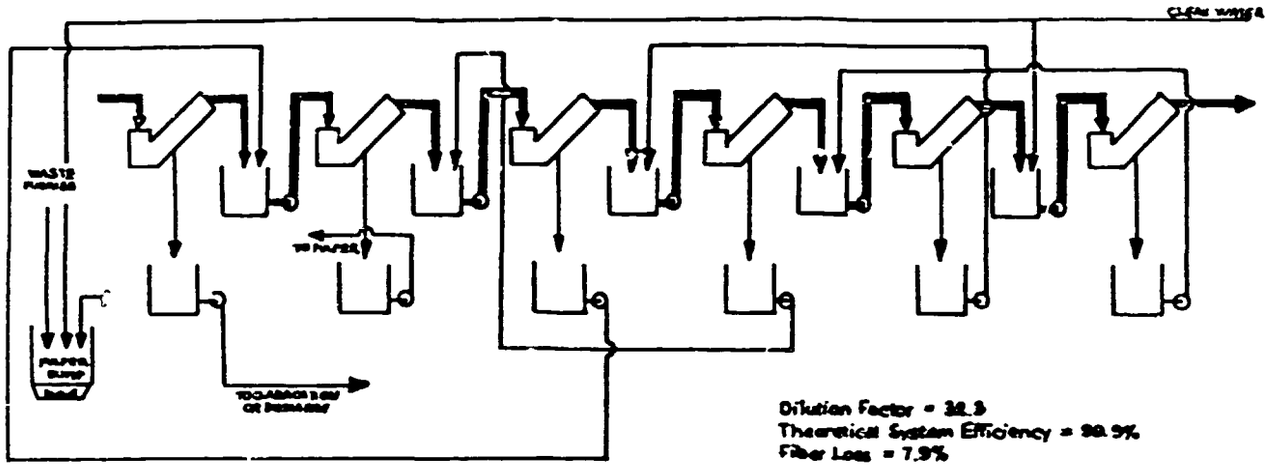
Source - Beloit Jones Corporation Dalton, Mass. U.S.A.



SIDEHILL SCREEN WASHING - 100 T/D

	QUANTITY	COST (per Unit)	TOTAL
Effluent Pumps	(6)	$ 6,174.	$ 30,870.
Drives	(5) 100 hp.	2,083.	10,415.
Washers	(5) 12' x 25' Wide	21,000.	105,000.
Feed Chests	(3) 22,8' d. x 20'	24,500	73,500.
Agitators/Drives	(3) #30, 36" d., 25 hp.	5,282.	15,846.
Effluent Chests	(5) 16,4 d. x 16'5'	15,500.	77,500.
Agitators/Drives	(5) #25, 30" d., 15 hp.	3,807.	19,035.
Feed Pumps	(3)	6,182.	18,546.
Drives	(3) 125 hp.	2,518.	7,554.
Total			$358,266.

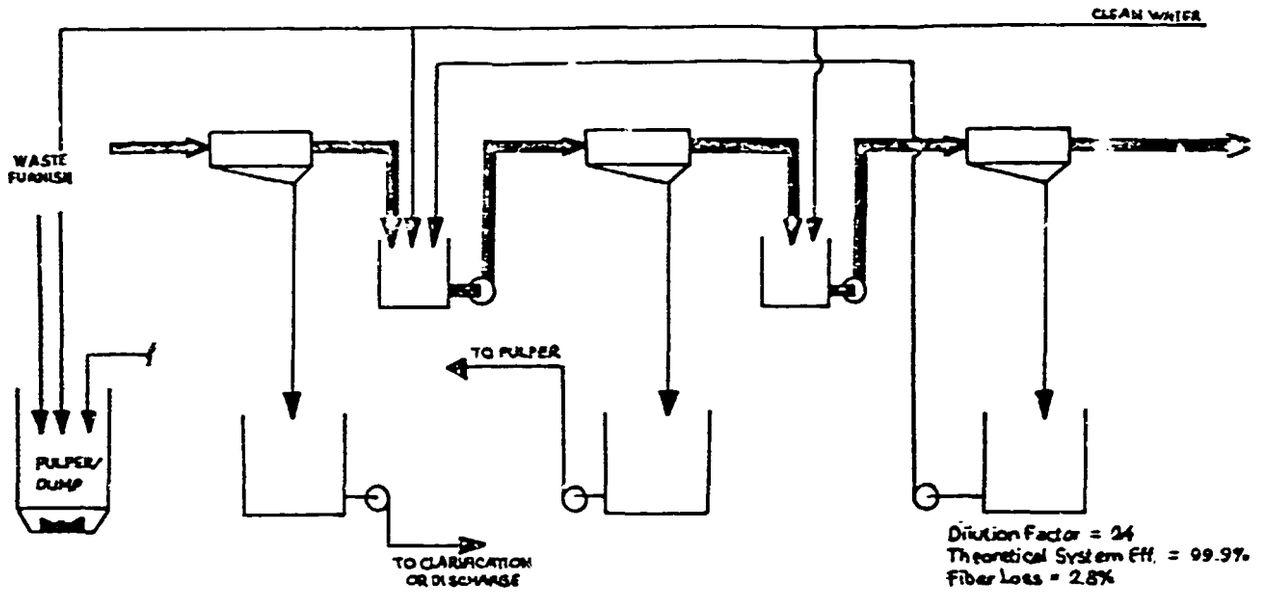
Source - Beloit Jones Corporation Dalton, Mass. U.S.A.



SCREW EXTRACTOR WASHING -100 T/D

	QUANTITY	COST (per Unit)	TOTAL
Washers	(36) 93/6" dia.	$11,200.	$403,200.
Drives	(36) 7.5 hp.	370.	13,320.
Feed/Resluny Chests	(6) 13' d. x 12.8'	11,100.	66,600.
Agitators/Drives	(6) #15, 24" dia., 15 hp.	3,642.	21,852.
Effluent Chests	(6) 9' d. x 10'	8000.	48,000.
Agitators/Drives	(6) #25, 18" dia., 5 hp.	3,259.	19,554.
Feed Pumps	(6)	2,450.	14,700.
Drives	(6) 25 hp.	420.	2,520.
Effluent Pumps	(6)	1,504.	9,024.
Drives	(6) 15 hp.	275.	1,650.
Total			$600,420.

Source - Beloit Jones Corporation Dalton, Mass. U.S.A.



PRESS WASHING - 100 BDT/D

	QUANTITY	COST (per Unit)	TOTAL
Washers	(6) 18" Horizontal Press	$70,600.	$423,600.
Drives	(6) 50 hp. (variable)	10,200.	61,200.
Feed/Reslurry Chests	(3) 11.4' d. x 12'	8,500.	25,500.
Agitators/Drives	(3) #32 28" dia., 25 hp.	4,601.	13,803.
Effluent Chests	(3) 8.4' d. x 9'	7,150.	21,450.
Agitators/Drives	(3) #25,18" d., 5 hp.	3,259.	9,777.
Feed Pumps	(3)	2,460	7,360.
Drives	(3) 25 hp.	420.	1,260.
Effluent Pumps	(3)	1,504.	4,512.
Drives	(3) 15 hp	275.	825.
Total			$569,277.

Source - Beloit Jones Corporation Dalton, Mass. U.S.A.

BOHAGER AND SONS

BALTIMORE, MARYLAND

Waste Paper Dealers

Bohager and Sons are dealers in waste paper. This is an interview with the President of the Company, Mr. Frank Bohager, to get an idea of the problems related to waste paper supply as well as meeting the quality requirements specified by the mills.

Q. What are the recycling newsprint mills you are supplying waste news?

A. None, at the moment.

Q. The deinking mills using waste news do not like to have excess quantities of magazines mixed up with the waste news. Do you think this could be sorted out by the waste paper dealers?

A. It does not pay to sort the waste paper by the dealer.

Q. What about mechanization of the sorting plant?

A. Even then, it is labor intensive and the economics are not sound for sorting by the waste paper dealers.

Q. What is the most economical distance for you to collect waste news?

A. About 20 to 30 miles.

Q. What is the employment potential in collecting, handling and storage of waste paper by the waste paper dealer per ton of waste paper?

A. It is not possible to give a figure based on 1 ton of waste paper. If we say 6 man days (8 hrs) are required per ton it does not mean 60 man days for 10 tons.

Q. Based on your experience as a waste paper dealer, what do you think would be an average figure for estimation purposes?

A. I will say about 3 to 4 man days (8hrs) per ton of waste paper.

Q. What was the average price of waste news delivered to mills last year (1981).

A. It is about $60 to $75 per ton delivered mills.

Q. Since storage of waste paper also costs money to the dealer, what is the maximum inventory you like to hold at any time?

A. I will not like to hold more than 250 to 300 tons of waste paper.

NORTH CAROLINA STATE UNIVERSITY

(RALEIGH, NORTH CAROLINA)

Date of Visit - September 25, 1981

Interview with Mr. Richard J. Thomas

Professor and Head

Department Wood Science and Paper Science

Q. Since you are one of the leading institutions for paper science, are you doing any research work or special project studies related to the deinking of waste news to make newsprint?

A. No, we have no special project or studies related to this field, but we are well equipped to conduct whatever studies that are required by any clients.

Q. If such a study is required how will you charge a client?

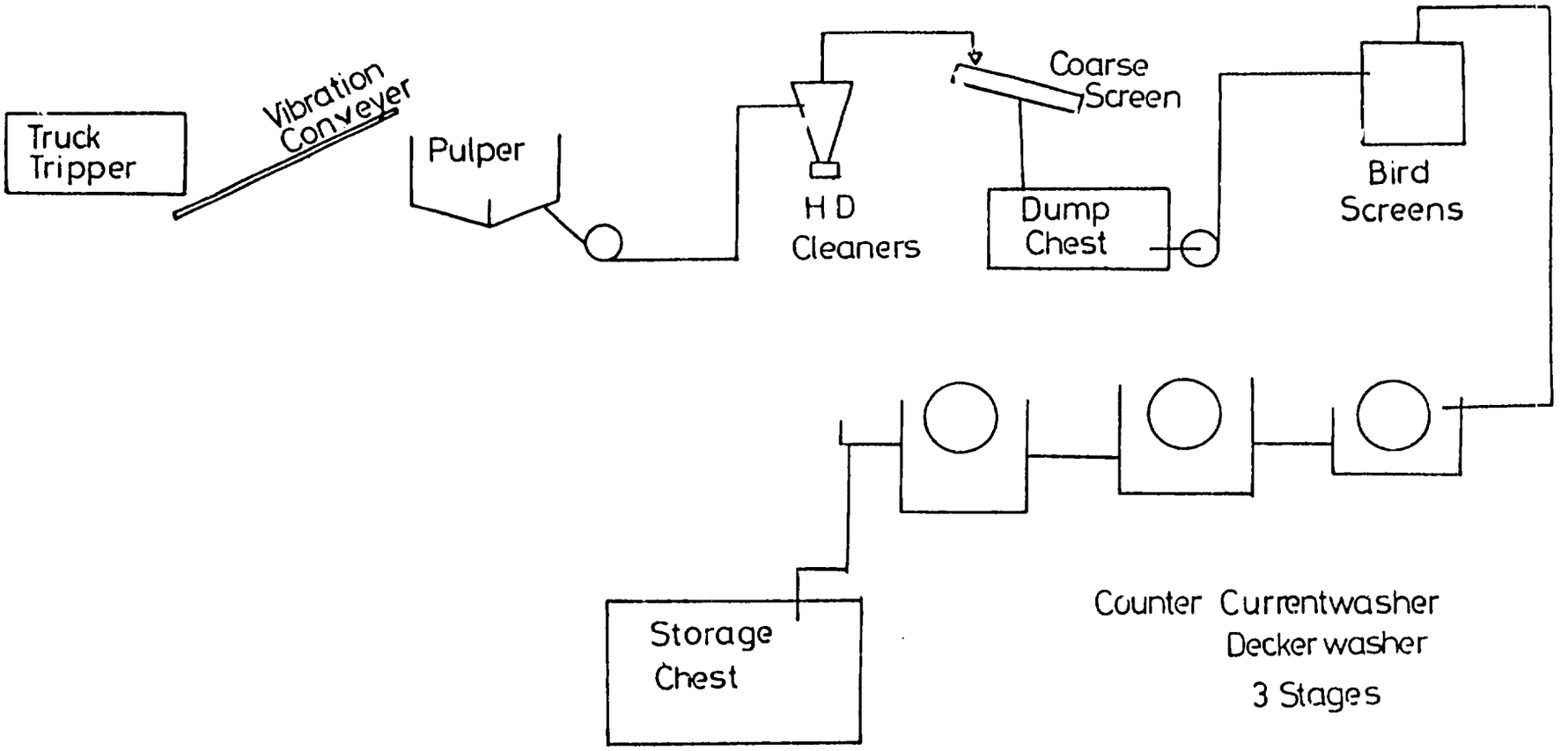
A. For small projects it is approximately $35 per laboratory hour. Strictly speaking the cost will depend on the nature of the project and we will submit a preliminary estimate based on the inputs that are necessary for such a project.

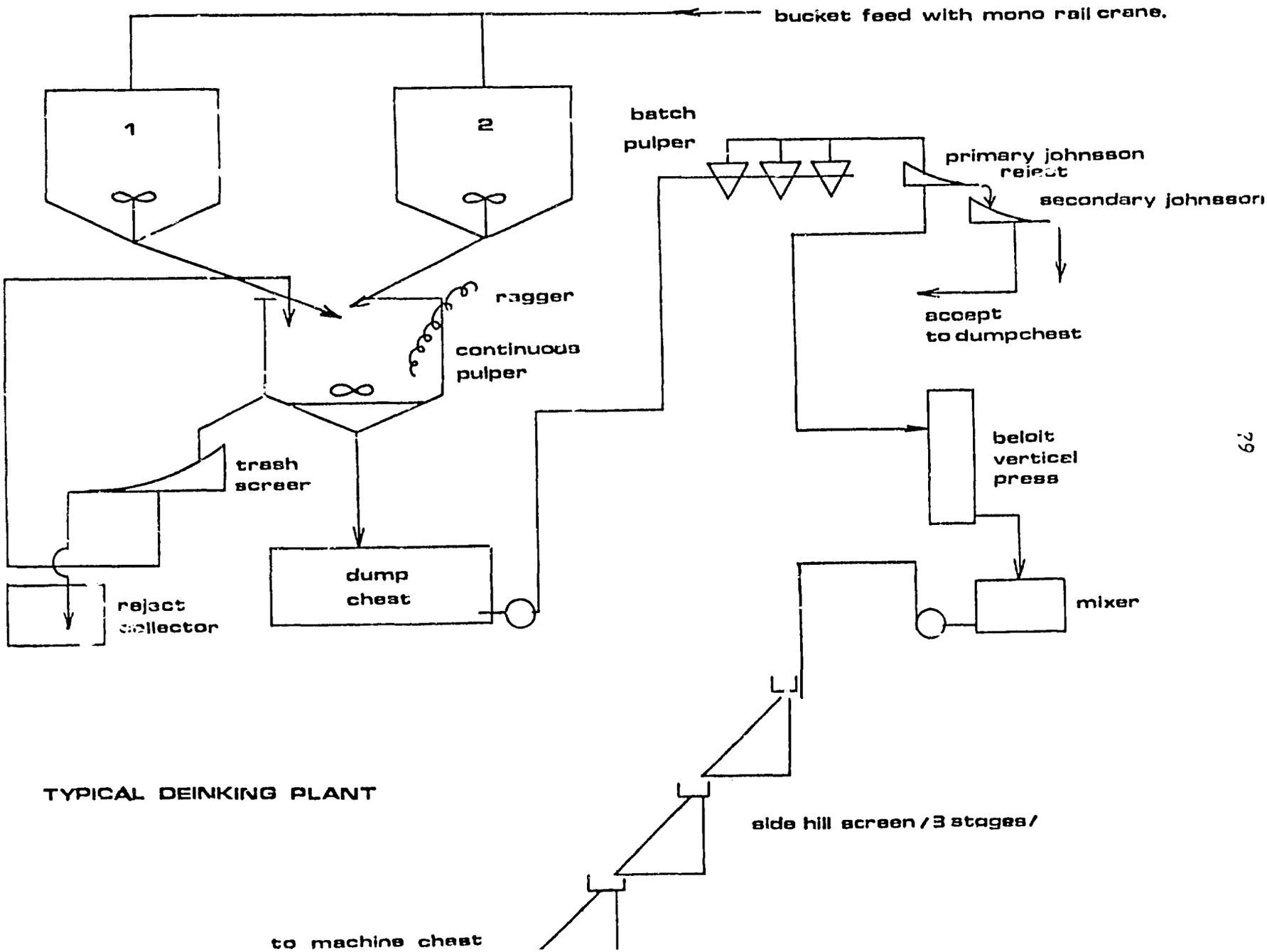
TYPICAL DEINKING SYSTEMS IN U.S.A.

AND CANADA

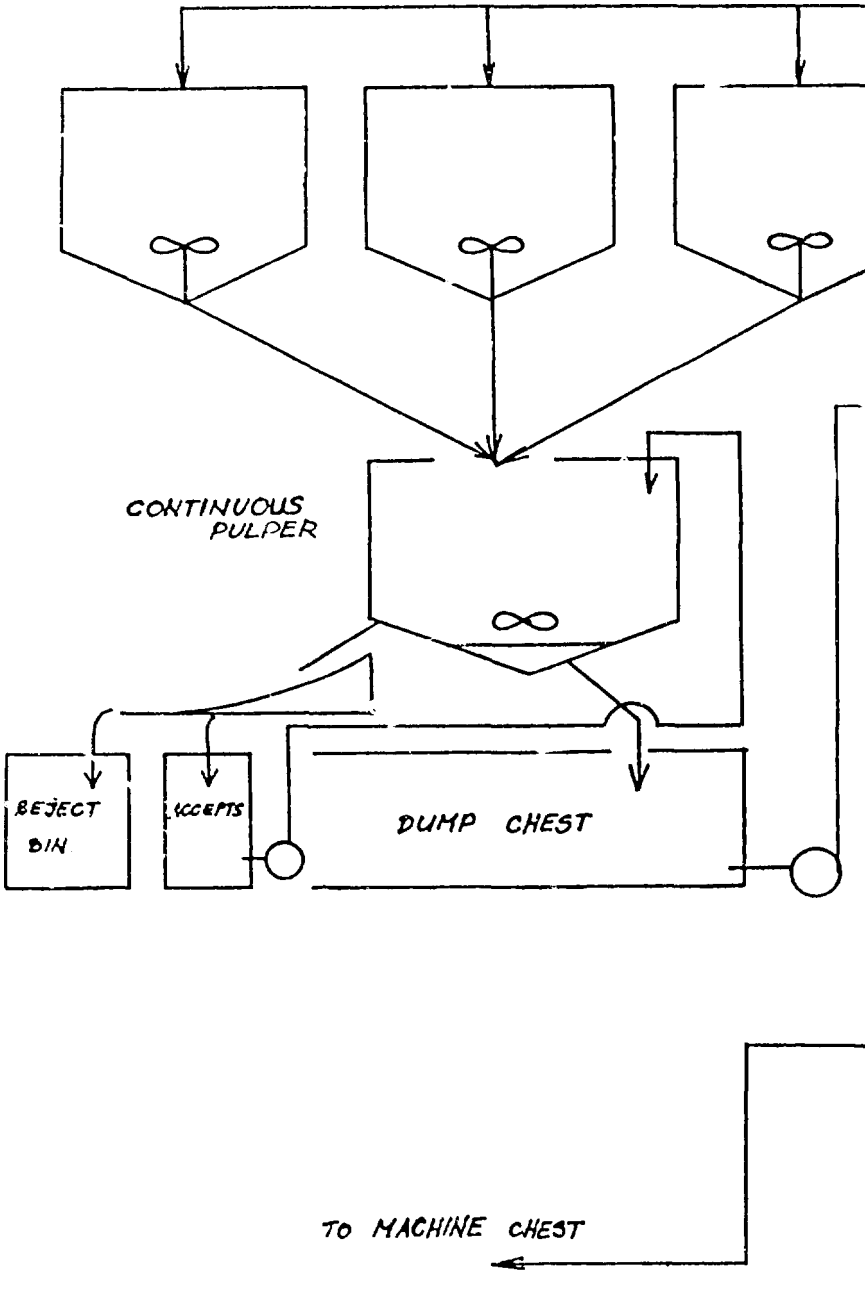
FLOW ARRANGEMENT

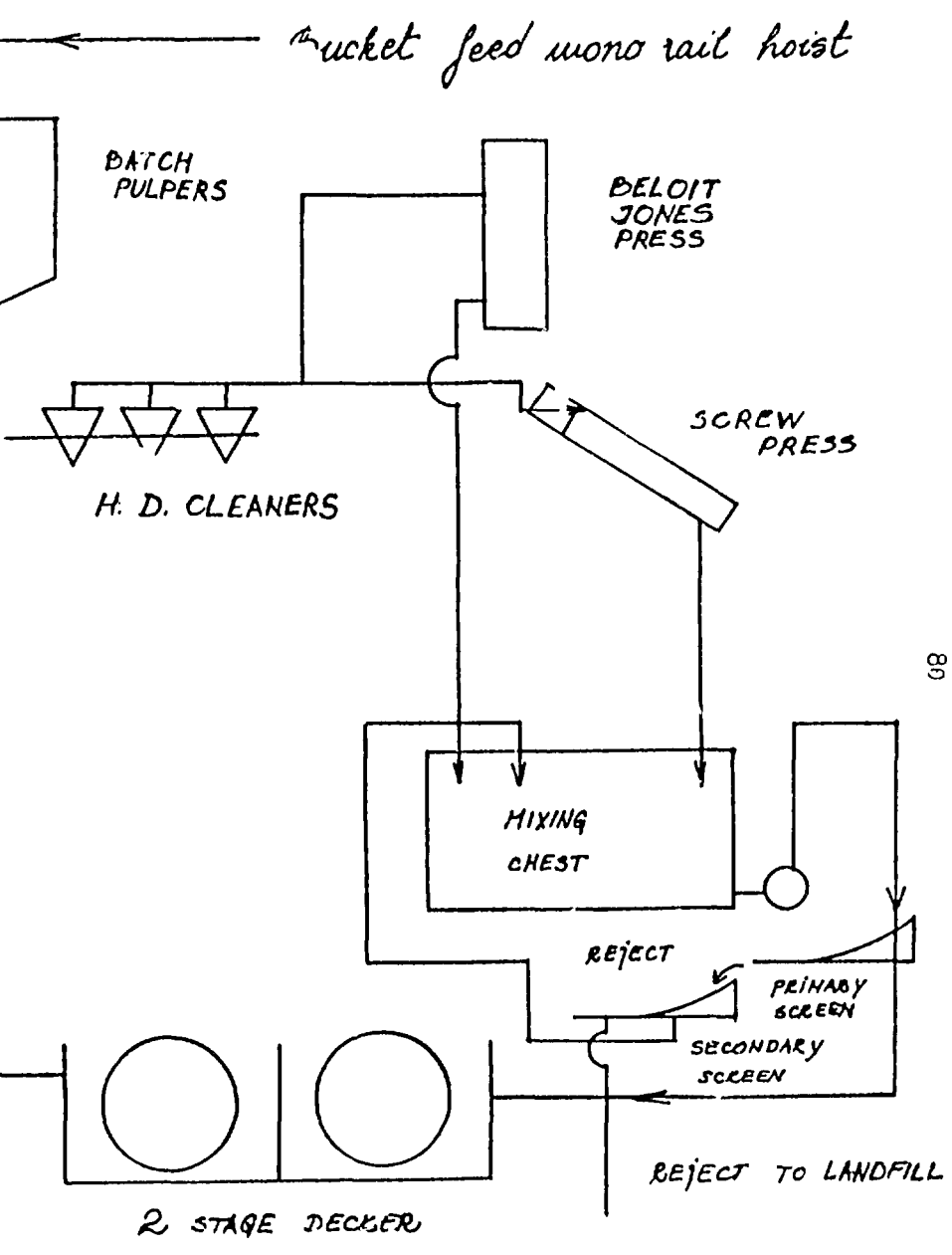
TYPICAL DEINKING PLANT



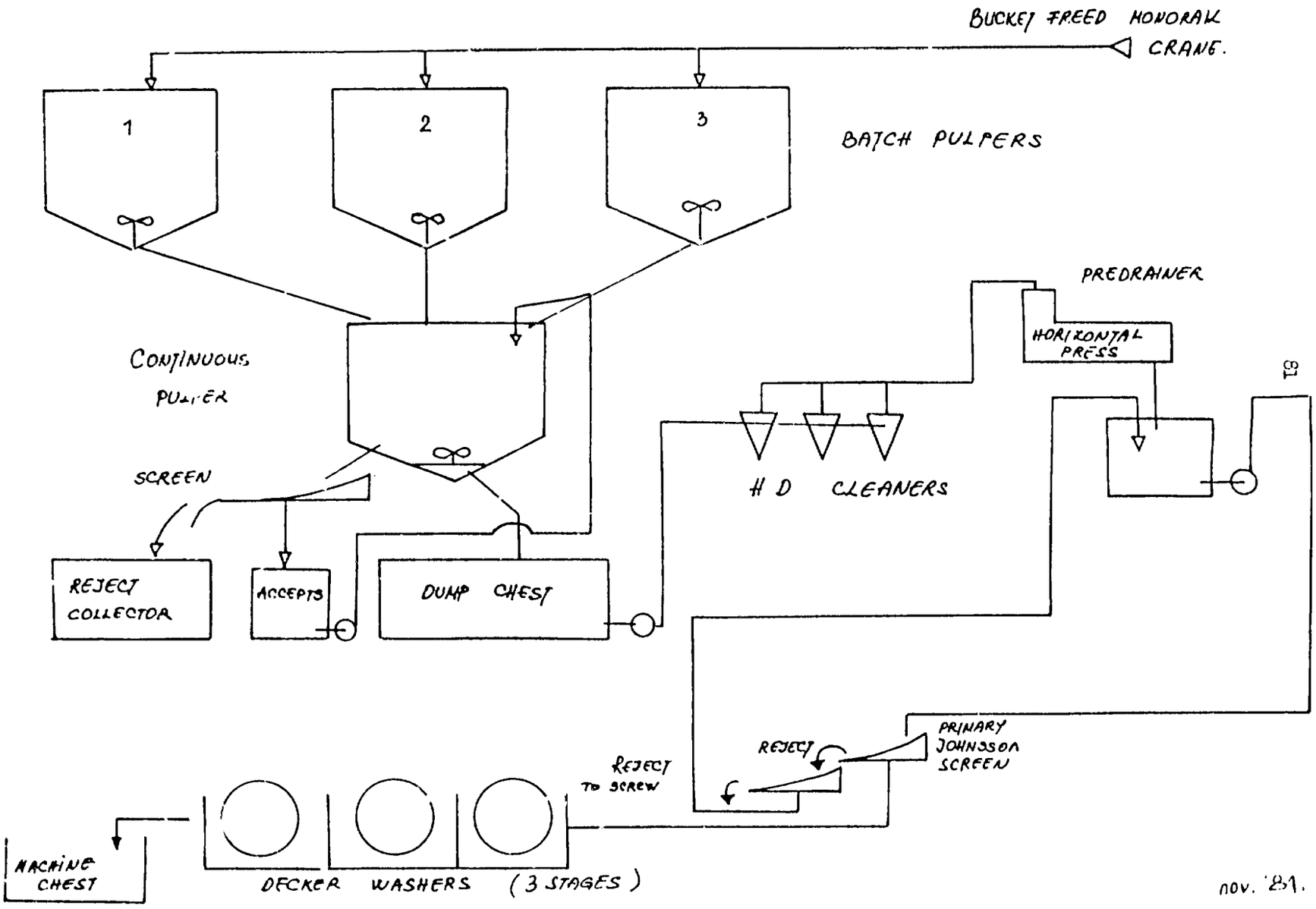


TYPICAL DEINKING PLANT


CONTINUOUS
PULPER
REJECT
BIN
ACCEPTS
DUMP CHEST
TO MACHINE CHEST

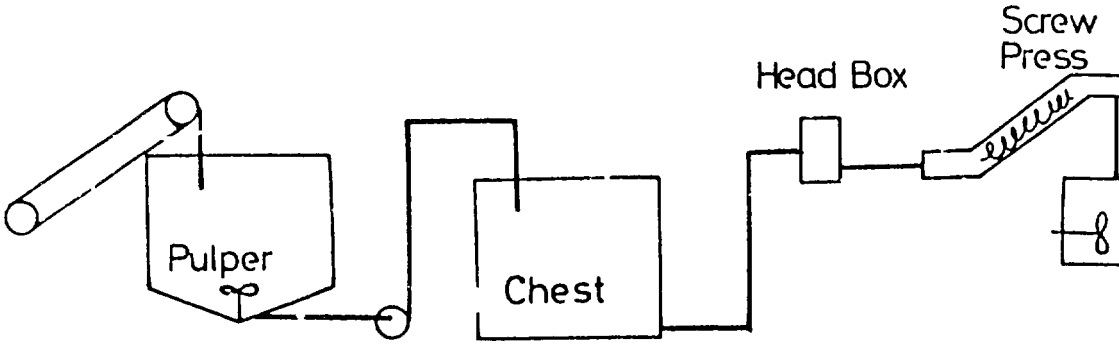

Bucket feed mono rail hoist
BATCH PULPERS
BELOIT JONES PRESS
SCREW PRESS
H. D. CLEANERS
MIXING CHEST
REJECT
PRIMARY SCREEN
SECONDARY SCREEN
REJECT TO LANDFILL
2 STAGE DECKER

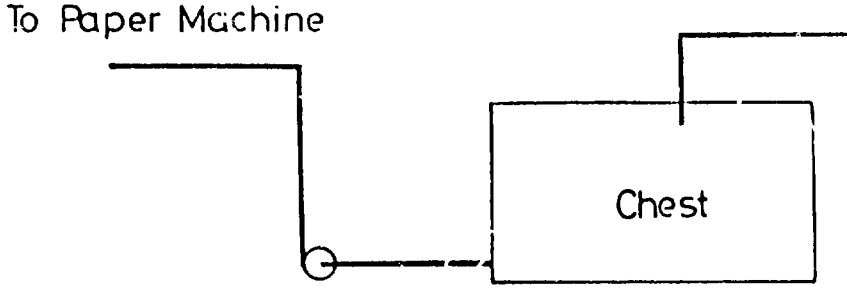
TYPICAL DEINKING PLANT

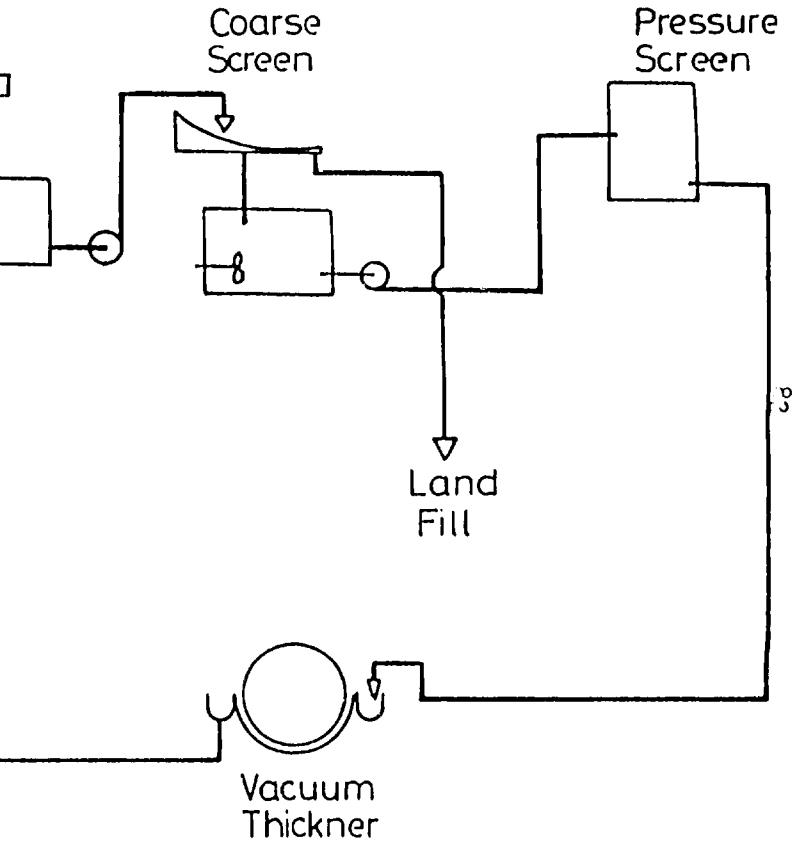


nov. '81.

TYPICAL DEINKING PLANT

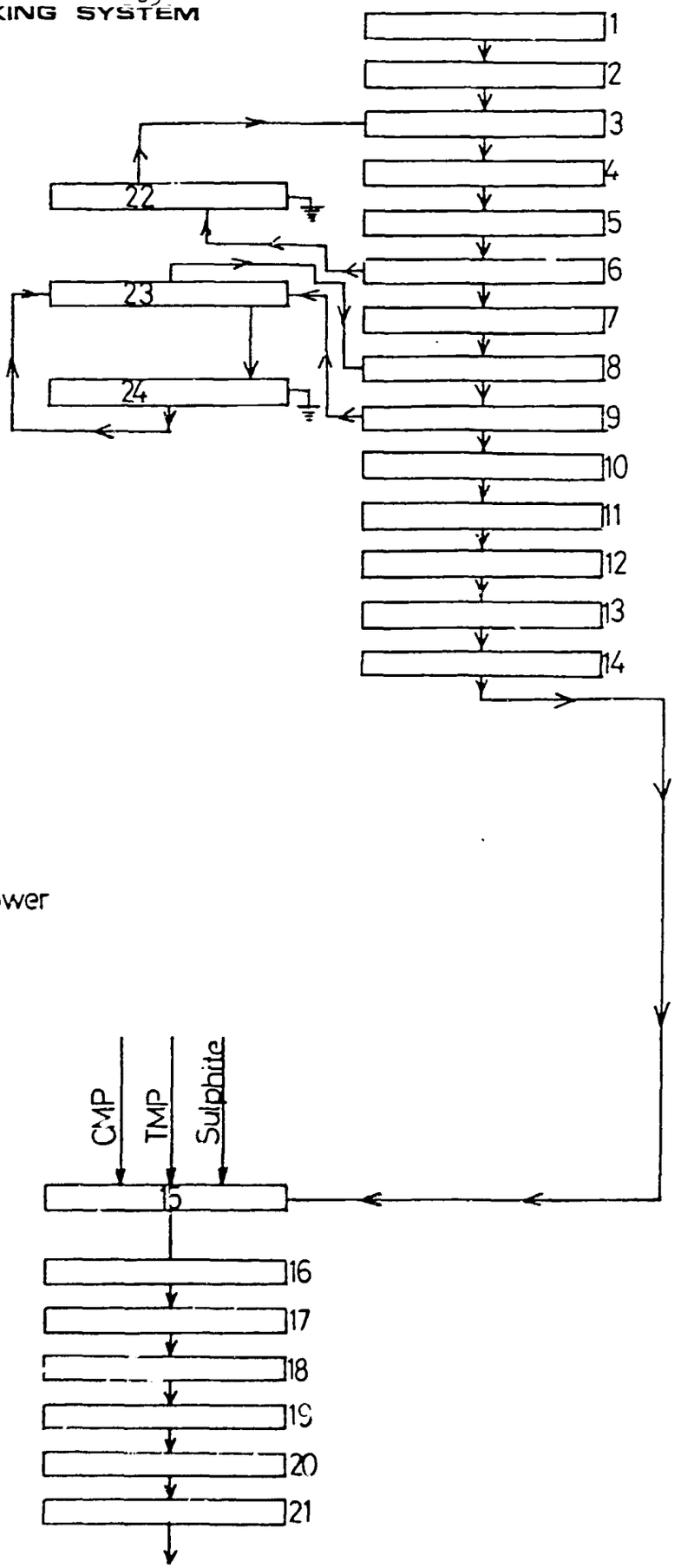





Coarse
Screen
Pressure
Screen
Land
Fill
Vacuum
Thickner

DEINKING SYSTEM

1 Waste paper Storage
2 Batch Pulper
3 Continuous Pulper
4 High Density Cleaners
5 Dump Chest
6 Belcor Cleaner
7 Press Washer
8 Soak Tank
9 Primary Screens
10 Decker Washer
11 Soak Tank
12 Press Washer
13 Press Tank
14 Blending Tank
15 Blending Chests for P.M.
16 Hydrosulphite Bleaching Tower
17 P.M. Chest
18 Deculator
19 Cleaning System
20 Pressure Screen
21 Paper Machine
22 Vibrating Screen
23 Secondary Screen
24 Vibrating Screen



AN APPROPRIATE DEINKING TECHNOLOGY FOR DEVELOPING COUNTRIES TO PRODUCE NEWSPRINT

The main problems to readership expansion in developing countries are on account of

- insufficient supply of newsprint
- high price of newsprint

As explained in the earlier pages this was acutely felt during the decade 1970-1980, and it could be said the situation has not so far improved.

The executive director of the Press Foundation of Asia summed up the situation of the scarcity of newsprint in Asia as follows:

> "The price of a newspaper whether in India or in the Philippines bears only an adverse relation with the income of the man in the street. Obviously, he is not tempted to buy a newspaper if a year's subscription is going to cost him as much as 15 to 25 days of his wages. No wonder then that in India, Pakistan, Thailand, Malaysia or in the Philippines newspapers have touched only a fringe of the population not anywhere more than two out of hundred. --- Newsprint is scarce everywhere in the region and more than anything else pushes the price of the daily paper up."
>
> Extract from: Mr. Amitabha Chowdhury, the Executive Director of PFA, as written in The Hindustan Times Weekly Review 3.1.1971.

The above reference, although applied to Asia, is also true of other developing countries in Africa, Latin America and the Eastern bloc countries.

The reasons for newsprint scarcity in developing countries is very complex due to technical as well as economic factors. However, some of

of the fundamental reasons could be summed up as follows:

- Most of the countries are short of the conventional woody materials (i.e. coniferous woods) to produce mechanical pulp. Although non-traditional materials such as hardwoods, bagasse etc. are being used by some developing countries, these materials too are either in short supply or are not available to most countries.
- The manufacture of conventional newsprint from mechanical pulp requires high energy inputs and most developing countries are short of cheap energy sources.
- Practically all the developing countries are acutely short of foreign exchange to import newsprint to satisfy their requirements.

With this situation of shortage of newsprint, lack of suitable raw material, high cost of energy to produce mechanical pulp, a case therefore exists to recycle waste news as part of the fiber furnish to produce newsprint.

Factors to be Considered in Selecting a Deinking Process System

The factors that have to be considered in selecting a suitable deinking process system for developing countries are as follows:

- Economy in capital costs for equipment
- Simple processing system for operation
- High degree of labor intensity
- Simplicity in maintenance with most replacement parts to be turned out locally.

Based on the above factors the deinking system that could be recommended for developing countries would comprise of simple process equipment in order to achieve the following:

- Pulping i.e. mechanical defibering by pulper along with deinking chemicals
- Cleaning and screening
- Washing

Pulping:

Pulping could be either a batch or continuous system. The batch method has the advantages of better control of deinking chemicals, water, and the quality of waste paper added to the pulper.To generate employment, which is an objective of most developing countries, the waste paper for deinking could be pre-sorted. Defibering is generally completed in the pulper if sufficient time is allowed for mechanical action. Periodic samples can be taken before dumping a batch to determine the pulping is complete to the degree required.

On account of the advantage of using a batch pulper, this is recommended for developing countries.

Cleaning:

The cleaning of wastepaper stock could be done using centrifugal cleaners. There are two options available:

- High pressure drop and low consistency
- Low pressure and high consistency

The high pressure drop cleaners generally operate at a pressure differential of 30 to 40 psi and in a consistency range of 0.4% to 0.8%. The low pressure drop cleaners operate at a 7 to 20 psi differential and a consistency of 0.8% to 5.0%.

For developing countries requiring simplicity in operation, low capital costs and conservation of energy, low pressure drop cleaners are recommended since they could be worked in a single stage arrangement in place of a multi-stage arrangement. In addition to generating employment in developing countries this could avoid high capital costs of elaborate equipment for cleaning and screening.

Screening

For the screening of waste paper stock the following equipment could be used:

- Pressure Screen
- Open Vibration Screen

The advantages of using an open type screen are:

- All parts are conveniently accessible and the screen basket can be raised or retracted for cleaning.
- The showers are suitable for fiber carrying water.
- The mechanical parts are simple and can be easily replaced.

On account of these advantages open vibration screens are recommended for developing countries. These screens could be conveniently arranged to perform both the primary and secondary functions.

Washing:

The washing of deinked pulp could be done by any of the following methods:

- Inclined screw presses
- Side hill washers
- Decker washers
- Vacuum washers
- Disc filters

Inclined Screw Presses

The inclined screw presses could be one, two or three inclined metal cylinders with a housing of perforated metal screen, a spiral screw and a lump breaker at the outlet. The dilute stock enters the base and is conveyed through the cylinder by the spiral screw and the liquid is expelled through the screen in passing. The inlet consistency for these presses could be in the range of 3 - 4% and discharge at 10 - 12%.

Side Hill Washer

This is a simple piece of equipment with no mechanical moving parts. The stock is delivered to a headbox at a consistency of 0.6 - 1%. From the headbox the stock is delivered to an inclined wire mesh which is generally inclined at an angle of 38°. The water drains through the wire and the stock tumbles down the inclined wire surface. The stock is collected at a 3 - 7% consistency. The mesh used is generally 58 x 80.

Decker Washer

This is composed of a rotating cylinder in a vat. The vat to contain the stock is generally made out of concrete. In this method the cylinder is partly immersed in the stock and the mat is formed on the cylinder surface. The facing wire for these cylinders are usuall 40 x 40 or 40 x 60. While working on deinked stock they generally operate on an inlet consistency of 0.5 to 1% and outlet consistency of 3 to 4%. These decker washers could be also built to operate with a riding roll to aid dewatering and to obtain a higher consistency of 8 to 10%.

Vacuum Washer

Vacuum washers used for deinked pulp processing are similar to those used for brown stock and bleached pulp washing. In the case of these washers vacuum is applied to remove the effluent of ink and water. The washers are capable of giving a discharge consistency of 12 - 15%.

Disc Type Washer

The principle of the disc type washer is similar to the vacuum washer. In this case the washing areas are arranged in discs in place of a large washing drum.

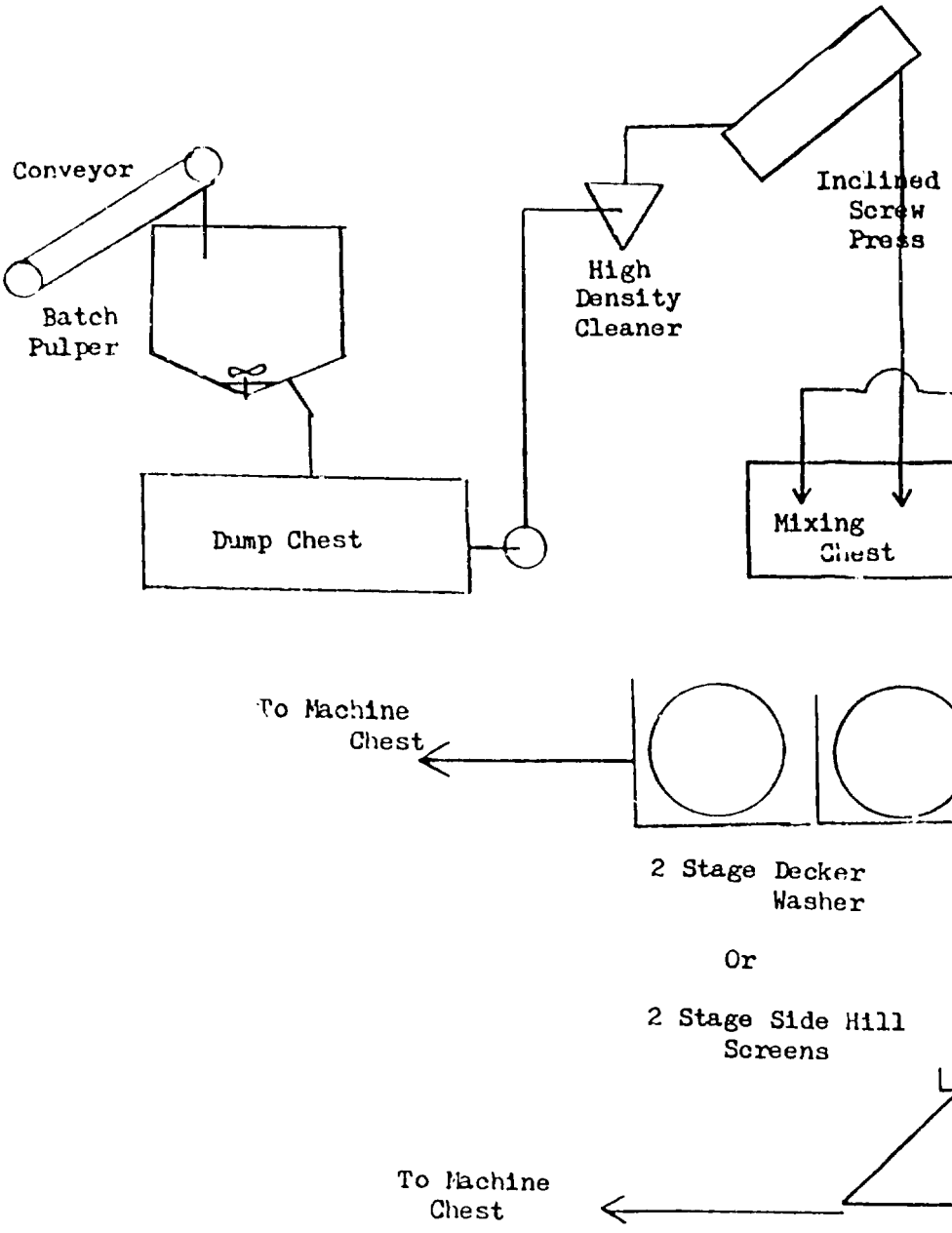
CHOICE OF WASHING EQUIPMENT

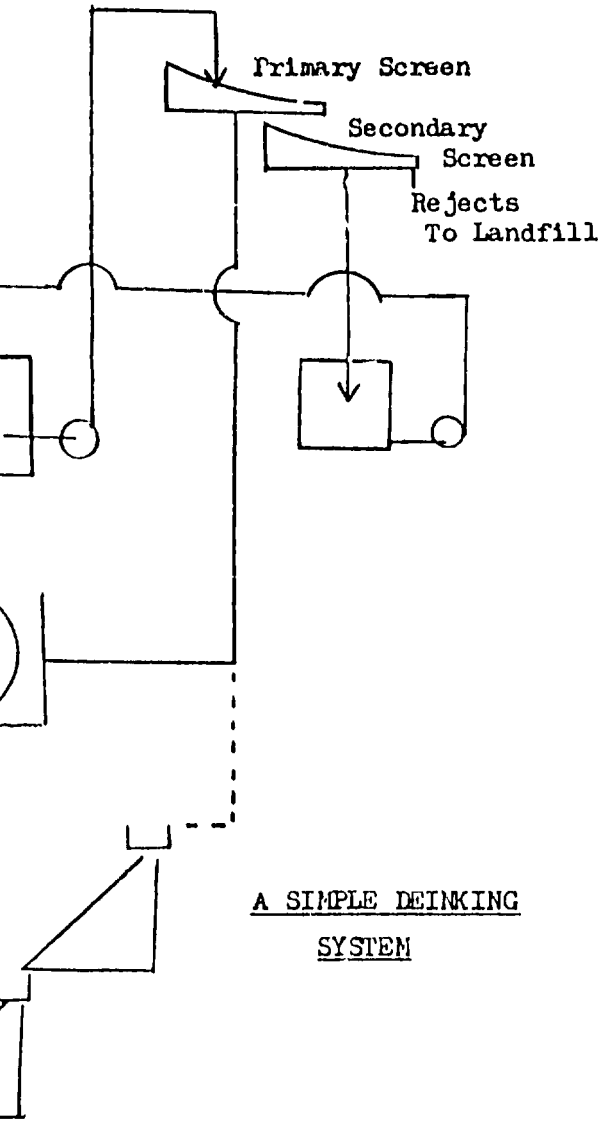
For developing countries requiring simplicity of equipment for operation and maintenance as well as reduced capital costs the choice of washing equipment would be limited to the following:

- Inclined screw washer
- Side Hill Washer
- Decker Washer

TYPICAL FLOWSHEET ARRANGEMENT FOR DEVELOPIN_ COUNTRIES

Based on the recommendations above for choice of equipment to perform the functions of pulping, cleaning, screening and washing a typical flow arrangement that could be suggested is as per diagram given on the next page.


Conveyor
Batch Pulper
Dump Chest
High Density Cleaner
Inclined Screw Press
Mixing Chest
To Machine Chest
2 Stage Decker Washer
Or
2 Stage Side Hill Screens
To Machine Chest



A SIMPLE DEINKING

SYSTEM

LIST OF U.S. PATENTS RELATED TO DEINKING

The following pages contain a list of important U. S. patents on the subject of deinking from the period 1952-1974. The list includes the inventor's name and the company to which the patent was assigned.

Full details of the technical process involved and the license to practice any of the inventions listed in the following pages should be obtained from the patent owners.

(1) U. S. Patent No. - 2 580 161
Date - Dec. 25, 1951
Developed by - C. C. DRIESSEN

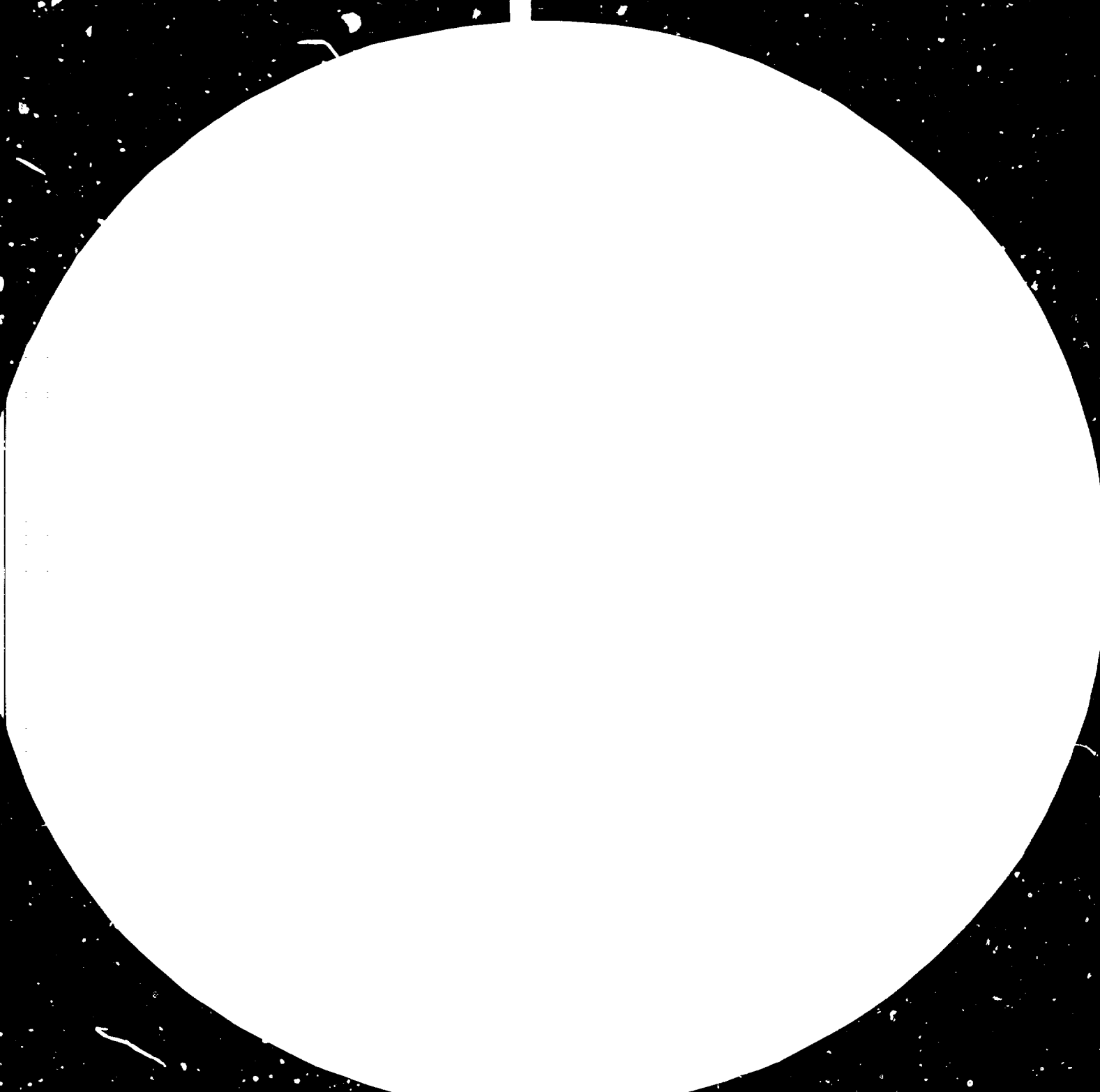
Deinking based on the use of Soap and Hypochlorite. It was found ink could be completely dispersed in a colloidal solution using Sodium Hydroxide, Sodium Hypochlorite and Sodium Palmitate (Soap). Such a colloidal solution could be filtered from the pulp thereby resulting in removal of ink.

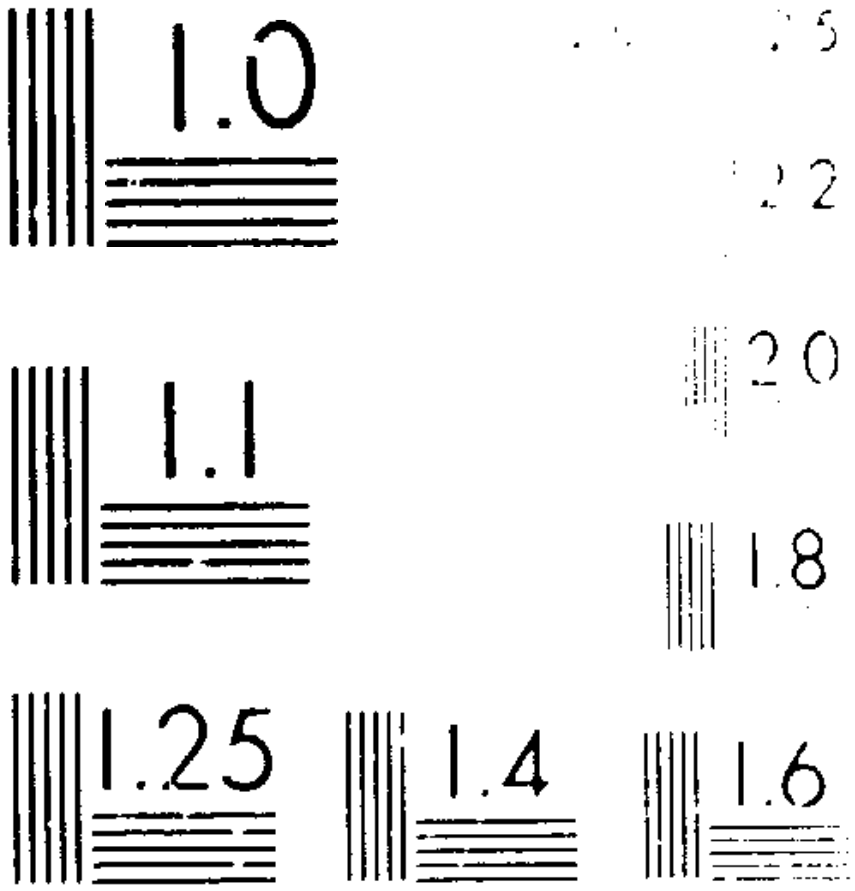
(2) U. S. Patent No. - 2 582 496
Date - Jan. 15, 1952
Issued to - P. J. MASSEY
Assigned to - ST. REGIS PAPER CO.

Deinking based on the use of Peroxides and Silicates and was particularly developed for paper containing ground wood pulp.

(3) U. S. Patent No. - 2 607 678
Date - August 19, 1952
Developed by - L. J. SCHEID
Assigned to - WATERVLIET PAPER CO.

Deinking based on the use of Petroleum Distillate. Developed specially for handling waste containing non saponifiable inks such as Rotogravure inks. In this deinking process a combination of Caustic Soda and Petroleum Distillate is used at a temperature of 190°F. The Caustic Soda is for removal of printing inks that are saponifiable (example - Linseed Oil) and the Petroleum Distillate (example - gasoline, kerosene etc.) is for removal of non-saponifiable inks.




1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5

(4) U. S. Patent No. - 2 620 271
Date - Dec. 2, 1952
Developed by - H. T. RUFF
J. F. STEVENSON
Assigned to - MEAD CORPORATION

The process is claimed to be suitable for waste paper containing substantial amount of ground wood. The porcess involves treatment with Caustic Soda followed by bleaching with Hypochlorite.

(5) U. S. Patent No. - 2 673 798
Date - March 30, 1954
Developed by - J. E. ZUNDEL
R. S. ARIES

This deinking process is based on the use of an Alkali Extract of Coniferous Bark with an inorganic detergent such as, Sodium Silicate, Sodium Carbonate, Tri Sodium Phosphate together with Caustic Soda.

(6) U. S. Patent No. - 2 743 178
Date - April 24, 1956
Developed by - W. J. KRODEL
N. HACKERMANN

Based on the use of electric current together with Salt and Detergent.
The detergent is used to loosen the ink binder and emulsify the ink particles. A Salt is added to charge the ink particles and the cellulose. The electric current is used to increase the separation of the Cellulose from the ink particles.
(Example of Salts - Sodium Pyro Phosphate ($Na_4P_2O_7$), Potassium Ferro Cyanide ($K_4\ Fe(CN)_6$)).

(7) U. S. Patent No. - 3 179 555
Date - April 20, 1965
Developed by - W. J. KRODEL
N. HACKERMANN

This is a further development of work done by W. J. KRODEL and N. HACKERMANN on the process described under U. S. Patent No. 2 743 178. It was found that rapid agitation and mixing caused ink particles to get embedded in the fiber and their removal was difficult. However when mixing was done less forcefully in an acqueous medium which already contained the chemicals dispersed uniformly the ink removal was greatly improved.

(8) U. S. Patent No. - 2 916 412
Date - Dec. 8, 1959
Developed by - N. A. ALTMANN
W. H. BUREAU
Assigned to - BUTLER CO.

This is a process of deinking without the use of chemicals at room temperature of about 70°F.

It was found the method of disintegrating and defibering in high speed refiners constitutes an important feature of the process. This action is combined with the process of washing or scrubbing the pulp at a relatively low consistency with the use of submerged jets.

(9) U. S. Patent No. - 3 025 213
Date - March 13, 1962
Developed by - C. L. COPELAND

The deinking method is based on the use of an agitation apparatus for separating ink and fiber in the waste paper. The violent agitation caused in the apparatus separates the ink particles from the fibers, and this treatment takes place in an acqueous medium. The ink is separated by filtering through pores that are demensioned to allow the ink particles to pass but not the fibers. This process of separation is repeated until the pulp is found suitable for paper making.

(10) U. S. Patent No. - 2 641 164
Date - June 9, 1953
Developed by - H. S. HILL
J. T. COGHILL

The deinking takes place by gyratory motion, produced on pulp that is already disintegrated. A compressed layer is formed between gyrating surfaces, and a flow of water is caused to pass through the agitated layer to achieve the deinking effect.

(11) U. S. Patent No. - 3 069 306
Date - Dec. 18, 1962
Developed by - K. J. LISSANT
Assigned to - PETROLITE CORPORATION

Deinking is based on the use of Oxyalkylated Water as the deinking agent.

(12) U. S. Patent No. - 3 069 307
Date - Dec. 18, 1962
Developed by - W. M. BOAZ
K. J. LISSANT
Assigned to - PETROLITE CORPORATION

Deinking is based on the use of Oxyalkylated Phenols as the deinking agent.

(13) U. S. Patent No. - 3 069 308
Date - Dec. 18, 1962
Developed by - K. J. LISSANT
Assigned to - PETROLITE CORPORATION

Deinking process is based on the use of Oxyalkylated Alcohols as the deinking agent.

(14) U. S. Patent No. - 3 098 784
Date - July 23, 1963
Developed by - W. S. FORMAN JR.
Assigned to - NATIONAL GYPSUM CO.

The deinking process is based on the use of Non-Ionic detergents that are water soluble. The preferred water soluble non-ionic surface active agent is an Alkyl Phenyl Ether of Polyethylene Glycol such as Tergitol NPX N Tergitol TMN which are produced by Union Carbide. Tritonx - 100 is another water soluble non-ionic detergent and this is produced by ROHM AND HASS.

(15) U. S. Patent No. - 3 072 521
Date - Jan. 8, 1963
Developed by - G. J. SAMUELSON
K. J. LISSANT
Assigned to - PEROLITE CORPORATION

The deinking process is based on the use of a surfactant in an organic solvent.

Typical example of a solvent (Kerosene)
Typical example of surfactant (Triton X 171 produced by ROHM & HAAS)

(16) U. S. Patent No. - 3 446 696
Date - May 27, 1969
Developed by - R. H. ILLINGWORTH
Assigned to - EVENING NEWSPUBLISHING COMPANY

This process recognizes the problem of deinking waste newspapers due to ink particles getting embedded in the cellulosic fibers producing the characteristic gray color. The deinking process is based on the use of a non-ionic detergent as the active agent. The non-ionic detergents suitable for use are condensation products of an Alkyl Phenol - Ethylene Oxide.

(17) U. S. Patent No. - 3 392 083
Date - July 9, 1968
Developed by - R. H. ILLINGWORTH
Assigned to - GARDEN STATE PAPER CO.

The use of non-ionic detergents developed as per U. S. Patent No. 3 446 696 do not give a satisfactory result when there is excess of rotogravure printing. To overcome this problem a deinking agent based on the use of Polyol in combination with a non-ionic detergent was

developed. The combination of these two ingredients have been found to be effective for deinking all types of printing waste irrespective of the type of printing inks and techniques.

(18) U. S. Patent No. - 3 501 373
Date - March 17, 1970
Developed by - R. H. ILLINGWORTH
Assigned to - GARDEN STATE PAPER CO.

This deinking process is based on the use of a non-ionic deinking agent combined with an aliphatic hydrocarbon or Chlorinated Aromatic Hydrocarbon. The combination of these ingredients is claimed to be effective for all types of printed waste regardless of printing ink and printing methods emplcyed.

(19) U. S. Patent No. - 3 354 026
Date - Nov. 21, 1967
Developed by - R. H. ILLINGWORTH
Assigned to - GARDEN STATE PAPER CO.

This deinking process is based on the use of a derivative of 4 Aminobutanol - 2 as the active deinking agent. This detergent may be used alone or with materials such as Alkali Phosphate, Polyphosphate, Hydroxide Sulfonates to improve the deinking effect.

(20) U. S. Patent No. - 3 377 234
Date - April 9, 1968
Developed by - R. H. ILLINGWORTH
Assigned to - GARDEN STATE PAPER CO.

This deinking process is based on the use of Alkyl Sulphates, Alkyl Aryl Sulfonates and Sodium Poly Phosphate.

Example of a typical formula will have the following chemicals:

Sodium Lauryl Sulphate
Sodium Didecyl Benzene Sufonate
Sodium Poly Phosphate

(21) U. S. Patent No. - 3 354 027
Date - Nov. 21, 1967
Developed by - S. V. HOSSAIN
A. A. PATAKI
Assigned to - ABITIBI CO., CANADA

This is a process of deinking based on the use of chemical agents such as Sodium Sulphite with a Polymer.

(22) U. S. Patent No. - 3 189 516
Date - June 15, 1965
Developed by - G. DUCHANGE

This is a process developed to remove dyes and pigments that are used in colored inks which are generally harder to remove compared to particles of carbon black from black ink.

This deinking method is based on the use of Sodium Bi-carbonate as a deinking agent coupled with various physical treatment.

(23) U. S. Patent No. - 3 946 227
Date - Nov. 5, 1974
Developed by - T. S. MESTETSKY
R. G. WEBSTER
Assigned to - G. A. F. CORPORATION

This de[illegible]ing process is based on making the waste paper to [illegible] in contact with an acqueous treating composition containing an N-Alkylactum Solvent at a temperature of about 110 to 210°F. The N-Alkylactum Solvent is not consumed in the treatment process and could be separated and recycled back to process waste paper.

(24) U. S. Patent No. - 3 354 028
Date - Nov. 21, 1968
Developed by - R. N. ILLINGWORTH
C. A. BENSON
Assigned to - GARDEN STATE PAPER CO.

In this process the ink is separated from the effluent of the deinking plant. The treatment of the effluent is based on chemically reversing the effluent pH as by raising the pH and then lowering the pH. This could be done conversely if desired by first lowering the pH and then raising it. The regulation of the pH as described above leads to the flocculation of the foreign matter suspended in the effluent to produce a clear water for recycling.

(25) U. S. Patent No. - 4 229 493
Date - Oct. 21, 1980
Developed by - B. BENDINER
B. I. MARGOLIS
Assigned to - FIBRE-CHEM CORP.

BALED WASTE PAPER PRODUCT CONTAINING A DEINKING CHEMICAL

A water-soluble or water-dispersible deinking chemical is incorporated into a bale of waste paper. The chemical is a synthetic organic surfactant effective to disperse ink present on the paper in the form of very small ink particles when the bale of waste paper is deinked and pulped in an aq. alkaline bath. The surfactant can be a Nonionic Polyoxyethylene Alcohol or Alkyl Phenol surfactant containing 1-50 moles of Ethylene Oxide adducted to an Aliphatic Alkanol having 8-20 carbons or to an Alkyl Phenol having 8-12 carbons in the Alkyl group. The surfactant can be applied to the bale by spraying the bale with an aq. solution or dispersion of the surfactant. Other treatment chemicals such as slimicides can be included in the treatment composition.

(26) U. S. Patent No. - 4 162 186
Date - July 24, 1979
Developed by - D. C. WOOD
R. L. McLAUGHLIN
Assigned to - DESOTO INC.

ALKALINE SURFACTANT SYSTEM FOR DEINKING PRINTED FIBROUS MATERIAL

A process is provided for deinking printed waste paper so as to provide a product of improved brightness. The process comprises adding the printed waste paper in dry form to an aq. surfactant-containing deinking solution in an amount to form a slurry containing no more than about 10 wt.% of fibrous solids, and agitating the slurry at a temp. between room temp. and the b. p.

of the solution to reduce the waste paper to individual fibers and to separate the ink from the fibers. The surfactant used is a mixture of at least one water-soluble nonionic surfactant and at least one oil-soluble nonionic surfactant present in the slurry in an amount of 0.1-5.0% based on weight of the fibrous solids. The wt. ratio of the water-soluble surfactant to the oil-soluble surfactant is 6-3·1. The water-soluble surfactant is composed of Ethoxylated Aliphatic Alcohols containing 9-15 carbons and having an average of 7-15 Ethyleneoxy units per mole of alcohol. The oil-soluble nonionic surfactant is composed of Ethoxylated Aliphatic Alcohols containing 9-15 carbon atoms and having an average of 0.5-3.5 Ethyleneoxy units per mole of alcohol.

(27) U. S. Patent No. - 4 157 952
Date - June 12, 1979
Developed by - M. KROFTA
Assigned to - LENOX INSTITUTE FOR RESEARCH

APPARATUS FOR DEINKING WASTE PAPER PULP

A foam flotation apparatus is provided for deinking waste paper in the process of recycling the paper for use in paper manufacture. An aq. slurry of the slushed waste paper, including flotation and other chemicals, is introduced into a cylindrical flotation tank in a tangential direction, together with air. This causes a swirling movement of the slurry within the tank from the slurry inlet to a central outlet. Froth or foam bubbles float to the surface of the slurry, along with the ink particles. A baffle plate leads to floating froth and ink particles to a vacuum-actuated outlet.

(28) U. S. Patent No. - 4 076 578
Date - Feb. 28, 1978
Developed by - I. E. PUDDINGTON
B. D. SPARKS
E. A. SEXTON
Assigned to - CANADIAN PATENTS & DEVELOPMENT LTD.
ONTARIO PAPER CO. LTD.

INK REMOVAL FROM WASTE PAPER

This process for deinking waste paper pulp by collecting the ink particles on ink-absorbent solid particles added to the pulp is related to the process described in Can. pat. 1 009 804; cf. ABIPC 48. abstr. 5578

(29) U. S. Patent No. - 4 013 505
Date - March 22, 1977
Developed by - C. BALCAR
A KOSTKA
J. HAVRANEK
M. LALAK
Assigned to - VYZKUMNY USTAV PAPIERU A CELULOZY

METHOD OF DEINKING PRINTED WASTEPAPERS

A process for deinking waste paper comprises impregnating the paper with a solution of an alkaline material such as NaOH (0.5-4.0% by wt. of paper) and a surfactant (0.2-2.0% by wt. of paper) having wetting and detergent power for releasing the printing ink from the paper, repulping the paper to separate the ink, adding large flakes of adsorptive material during the repulping together with an organic hydrocarbon to improve adsorption of ink onto the flakes, and then removing the flakes with the adsorbed printing ink from the repulped paper by latent vortex action in an outer vortex in the solution in which the repulped paper is suspended. The surfactant can be an Alkyl Benzene Sulfonate, a fatty acid Alkylolamide, or the like. The

flakes are precipitated from a solution of metal soaps of organic acids by adding a solution of a salt of an alkaline earth metal preferable in the presence of a loading material such as China Clay. For example, the flakes can be made from a solution of Sodium Salt of Tall Oil Soap by adding Calcium Chloride solution and China Clay.

(30) U. S. Patent No. - 3 986 922
Date - Oct. 19, 1976
Developed by - E. T. PARKER
C. G. JINKS
Assigned to - BASF WYANDOTTE CORP.

METHOD OF DEINKING PRINTED WASTE CELLULOSIC STOCK

A process for deinking printed waste paper comprises pulping the waste paper in an aq. solution containing 0.5-2.0% by wt. of an alkali metal Hydroxide (e.g., NaOH) and 0.3-0.7% of a Phosphate Ester Anionic surfactant which is a mixture of Mono- and Diesters prepared by reacting a Polyphosphoric Acid with a nonionic surfactant containing Oxypropylene and/or Oxyethylene groups.

(31) U. S. Patent No. - 3 963 560
Date - June 15, 1976
Developed by - T. S. MESHETSKY
B. G. WEBSTER
Assigned to - GAF CORP.

COMPOSITION FOR DEINKING WASTE PAPER

This patent dealing with the deinking of waste paper with a composition based on an N-alkyllactam solvent covers the composition used according to the process described in U.S. pat. 3 846 227; cf. ABIPC 45: abstr. 10120.

(32) U. S. Patent No. - 3 932 206
Date - Jan. 13, 1976
Developed by - R. H. ILLINGWORTH
F. W. LOREY
Assigned to - GARDEN STATE PAPER CO. INC.

PROCESS FOR DEINKING PRINTED WASTE CELLULOSIC FIBROUS MATERIAL

A process for deinking printed waste paper comprises adding the waste paper to a deinking solution consisting of water, a biodegradable deinking agent which is nontoxic to aquatic life, and a material (e.g., alkali metal hydroxide or Silicate) for maintaining the pH of the solution at 7.0-11.5; maintaining contact between the paper and the solution until the ink separates from the fibers; and washing the deinked paper. The deinking agent is an Ethoxylated Aliphatic di-ol having 14-30 carbon atoms in the aliphatic chain and 8-24 Ethyleneoxy units per mole of di-ol, with the Hydroxy groups in the di-ol being present on adjacent nonterminal carbon atoms in the Aliphatic chain.

(33) U. S. Patent No. - 3 912 579
Date - Oct. 14, 1975
Developed by - J. BRAUN
Assigned to - BERGSTROM PAPER CO.

REVERSE CLEANING AND DEINKING OF PAPER STOCK

A method is provided for recovering usable paper fibers from a slurry of waste paper stock including contaminants having a sp.gr. less than that of water and other contaminants (e.g., ink peppers, clays, pigments, etc.) which are heavier than water but which have a high hydraulic drag coefficient. The separation is effected by passing the slurry through a cyclone-type separator which is operated in reverse manner, i.e., so that the fraction rich in usable fiber is discharged at the bottom (apical) outlet, while the fraction rich in both types of contaminants migrates to the core of the vortex and is discharged at the top (base) outlet.

(34) U. S. Patent No. - 3 846 227
Date - Nov. 5, 1974
Developed by - T. S. WESTETSKY
B. G. WEBSTER
Assigned to - GAF CORP.

DEINKING OF WASTE PAPER WITH AN AQUEOUS SOLUTION CONTAINING AN N-ALKYLLACTAM SOLVENT

Waste paper is deinked by trmt. with a cpn. contg. an N-alkyllactam solvent at a temp. of 110-210 F. The solvent is not consumed in the trmt. process and can be sepd. for reuse. Among the more suitable solvents is N-cyclohexyl Pyrrolidone.

(35) U. S. Patent No. - 3 635 789
Date - Jan. 18, 1972
Developed by - C. J. GREEN
Assigned to - XEROX CORP.

DEINKING OF WASTE XEROGRAPHIC COPY PAPER

A flotation process for the removal of toner from waste xerographic copy paper comprises adding a thin film of an immiscible org. solvent to an aq. bath of repulped waste xerographic paper, mildly agitating the stock suspension, and skinning off the accumulated toner contained in the immiscible org. layer.

(36) U. S. Patent No. - 3 635 788
Date - Jan. 18, 1972
Developed by - H. J. BRAUN
S. A. DUNN

DEINKING AND REMOVAL OF CERTAIN CONTAMINANTS FROM RECLAIMED PAPER STOCK-HEAVYING

In certrifugal cleaning and deinking of reclaimed defibered paper stock, the sepn. of contaminants having about the same sp.gr. as the fibers is facilitated by adding a matl. which treats the contaminants selectively and causes them to assume the characteristics of heavier solids. A suitable additive is Monochlorobenzene.

(37) U. S. Patent No. - 3 557 956
Date - Jan. 26, 1971
Developed by - H. J. BRAUN
S. A. DUNN
Assigned to - BERGSTROM PAPER CO.

METHOD FOR DE-INKING AND REMOVAL OF CERTAIN CONTAMINANTS FROM RECLAIMED PAPER STOCK

In cleaning and deinking reclaimed paper stock in a vortex-type separator, a method is provided for separating contaminants having about the same sp.gr. as the fibers. A fluid is introduced into the stock to treat the contaminants selectively and cause them to assume the characteristics of lighter solids so that they are retained in the inner part of the vortex in the cleaner while the fibers are thrown to the outer part of the vortex. Preferred treatment liquids include Aliphatic Hydrocarbons such as N-pentane.

(38) GER. Patent No. - 1 301 708
Date - Aug. 21, 1969
Developed by - R. H. ILLINGWORTH
Assigned to - HOLLIFIELD CORP.

PROCESS FOR DEINKING PRINTED PAPER

The process for deinking waste paper claimed in Ger. pat. 1 278 815 (cf. ABIPC 41: abstr. 2845) is modified in that in making up the aq. soln., water of a carbonate hardness of less than 15 ppm is used.

(39) U. S. Patent No. - 3 501 373
Date - March 17, 1970
Developed by - R. H. ILLINGWORTH
Assigned to - GALDEN STATE PAPER CO., INC.

DEINKING WASTE PRINTED CELLULOSIC STOCK

Deinking of waste paper stock is accomplished using as the deinking compound a nonionic surface-active agent, such as an Ethylene Oxide adduct of Dodecylphenol and a hydrocarbon such as Naphtha or Chlorobenzene.

LIST OF

NEWSPRINT MILLS WORKING WITH DEINKED PULP

IN U.S.A. AND CANADA

		Deinking Capacity TPD	Newsprint Capacity TPD	Average Percentage of Deinking Pulp Used
(1)	GARDEN STATE PAPER CO. GARFIELD, N. J.	600	530	100%
(2)	GARDEN STATE PAPER CO. POMONA, CA.	310	310	100%
(3)	FSC PAPER CORP. ILLINOIS	310	310	100%
(4)	SOUTH EAST DUBLIN, GA.	535	480	100%
(5)	SOUTH WEST FOREST IND. SNOWFLAKE, ARIZONA	215	450	45%
(6)	PUBLISHERS PAPER CO. OREGON CITY, ORE.	120	660	25%
(7)	PUBLISHERS PAPER CO. NEWBERG, ORE.	250	900	25%
	CANADA			
(1)	ONTARIO PAPER CO. THROLD, ONT.	230	1 000	23%

LIST OF

NEWSPRINT MILLS WORKING WITH DEINKED PULP

IN OTHER PARTS OF THE WORLD

Company/Location	Deinking Capacity TPD	Newsprint Capacity TPD	Percentage of Deinked Pulp Used *(Estimated)
WEST EUROPE AND SCANDINAVIA			
AUSTRIA			
LEYKAM/MURZTALER	85	290	25%
STEYREMUHL/STEYREMUHL	50	245	20-25%
BELGIUM			
PAP de BELGIQUE/LANGER BRUGGE	120	660	20%
HOLLAND			
VAN GELDER MILL/RENKUM	200	400	50%
WEST GERMANY			
HAINDL/SCHONGAV	400	1 000	40%
HOLTZMANN/WOLF SHECK	20	350	--
NORWAY			
UNION/SKIEN	60	--	25%
SPAIN			
PAPEL ERA PENINSULAR	10	75	10%-15%
SWEDEN			
HOLMENS BRUK/HALLSTAVIK	200	1 450	10%-15%
HYTLE BRUCKS/HYTLEBRUK	280	1 350	20%
STORA KOPPARABERG/KUARNSVEDEN	70	950	10%

* The above figures are estimated because it was not possible to recheck figures that were obtained from directories and journals due to limited time available in preparing this study.

			*Estimated
SWITZERLAND			
UTZENDORF PAPIER FABRICK			
UTZENDORF	85	290	25%
UNITED KINGDOM			
BOWATER (MERSEY MILL)	70	510	10%-15%
REED (AYLESFORD MILL)	80	—	—
REED (IMPERIAL MILLS)	200	—	—

* The above figures are estimated because it was not possible to recheck figures that were obtained from directories and journals due to limited time available in preparing this study.

EAST EUROPE

			*(Estimated)
GDR			
SCHWEDT/SCHWEDT	60	--	--
KRIEBSTEIN/WALDHEIM	60	--	--
YUGOSLAVIA			
DJURO SALAT/KRISKO	56	245	20%-25%

ASIA

JAPAN			
DAI SHOWA/FUJI	200	--	--
DAI SHOWA/SHIRAOI	20	--	--
DAI SHOWA/IWANUMA	100	--	--
HYOGO/HYMEJISHI	65	75	80%-85%
JUJO/YATSUSHIRO	100	350	25%
MARUSUMI/KAWANOE	240	500	40%-45%
OJI/TAMAKOMAI	860	2 025	40%-45%
TAIO/IYOMISHIMA	540	--	--
/FUTASUKA	60	--	--
KOREA			
SEIDAI/KUNSAN	80	200	40%
INDIA			
SRIVENCATESA/UDAMALPET	10	--	--

LATIN AMERICA

MEXICO			
SAN LUIS POTOSI	--	--	--

* The above figures are estimated because it was not possible to recheck figures that were obtained from directories and journals due to limited time available in preparing this study.

INDEX OF ABBREVIATIONS

AD	-	Air Dry
ANPA	-	American Newspaper Publishers Association
AV	-	Average
BD	-	Bone Dry
BTU	-	British Thermal Units
CMP	-	Chemi-mechanical Pulp
CPPA	-	Canadian Pulp and Paper Association
CSF	-	Canadian Standard Freeness
^{o}C	-	Degree Celsius
^{o}F	-	Degree Fahrenheit
$	-	U. S. Dollar
'	-	Feet
FPM	-	Feet Per Minute
Gals	-	Gallons
G E	-	General Electric
G/M^2	-	Grams Per Square Meter
HD	-	High Density
Hr	-	Hours
"	-	Inches
KWH	-	Kilowatt Hour
lbs	-	Pounds

INDEX OF ABBREVIATIONS (continued)

MGPD	-	Million Gallons Per Day
MILS	-	One Thousandth of an Inch (25.4001 microns)
Mins	-	Minutes
NJ	-	New Jersey
ph	-	Hydrogen Iron Concentration
Pli	-	Pounds Per Lineal Inch
psi	-	Pounds Per Square Inch
RGWP	-	Refiner Groundwood Pulp
SGWP	-	Stone Groundwood Pulp
TMP	-	Thermo-mechanical Pulp
TPD	-	Tons Per Day
U. S.	-	United States
U. S. A.	-	United States of America

PERSONS WITH WHOM DISCUSSIONS WERE HELD AND THOSE WHO DIRECTLY AS WELL AS INDIRECTLY PROVIDED ASSISTANCE FOR THIS STUDY

(1) UNITED NATIONS INDUSTRIAL DEVELOPMENT PROGRAMME

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  Senior Industrial Development Officer

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and
GARDEN STATE MILLS (Garfield N. J.)

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  Chairman of the Board (GARDEN STATE PAPER GROUP)
- MR. JAMES E. EVANS
  Senior Vice President - MEDIA GENERAL INC.
- MR. JAMES LINEN - MEDIA GENERAL INC.
- MR. RAY H. CROSS
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(5) SOUTH EAST PAPER MFG. CO. (Dublin, Georgia)

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(6) SOUTH EAST RECYCLING CORPORATION (Atlanta, Georgia)

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(7) PUBLISHERS PAPER COMPANY (Oregon City, Oregon)

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ANNEX 1

OTHER USES OF DEINKED PULP IN NORTH AMERICA

OTHER USES OF DEINKED PULP IN NORTH AMERICA

Besides the production of newsprint from deinked pulp which is the subject of this study it will be of interest to know it is also part of the fibre furnish for other grades of paper.

There are 50 mills in North America producing deinked pulp. Forty-five are in USA and five in Canada. The table below gives information on the grades of paper produced, the total tonnage of each grade, and the average percentage of deinked pulp in the fibre furnish.

Grade	No. of Mills	Paper Produced (000TPD)	Deinked pulp produced (000TPD)	Percentage of deinked pulp
		USA		
Newsprint	7	3572	1517	42
Tissues/towels	19	2704	2289	82
Writing/printing	11	2545	1095	43
Liner/box board	3	1290	205	16
Market pulp	5	650	650	100
		Canada		
Newsprint	1			
Tissues/towels	2	265	165	62
Printing/writing	1	260	110	42
Liner/box board	-	-	-	
Market pulp	-	-	-	

List of Deinking Mills in North America

TISSUES AND TOWELS GRADE

Mill	Prod. Capacity TPD	Deinking Capacity	Type of Wash	Type of Deinking
USA				
- Americancan Ashland (Wis)	50	50	Cupstock Food Board	Washing
- Baldwinsville Products Baldswinville (Mass)	100	100	Varied	Washing
- Bio Tech Mills Battenville (NY)	54	9	Varied	Washing
- Brown Co. Eau Claire (Wis)	160	160	Ledger	Washing
- Brown Co. LadySmith (Wis)	55	50	-	Dispersion
- Crown Zellerbach Carthage (NY)	135	45	Ledger and News	Floation
- Ervuing	100	60	Ledger	Washing
- Fort Howard Green Bay (Wis)	900	810	Ledger News	Washing
- Fort Howard Muskogee (Okla)	200	180	Ledger News	Washing
- Georgia Pacific Gary (Ind)	80	50	Ledger Magazine	Washing
- Hinsdale Product Hinsdale (NH)	30	30	Ledger	Washing
- Marcal Elmswood Park (NJ)	250	200	Ledger Magazine	Washing
- Nitel Paper Niagara Falls(NY)	150	Idling		Washing
- Partician South Glens Falls(NY)	110	65	Ledger Food Boare	Washing
- Pendcrosa Flagstaff (Ariz)	50	50	Polycoated Board Ledger	Washing
- Putney Paper Putney (Vt)	40	20	-	Floatation

Mill	Prod. Capacity TPD	Deinking Capacity	Type of Wash	Type of Deinking
- Robel Tissue	100	100	Ledger	Washing
- Scott Detroit (Mich)	100	60	Milk Carton Ledger	Washing
- Statler Augusta (Maine)	150	150	Ledger	Washing
- Wisconsin Menasha (Wis)	100	100	Ledger	Washing
CANADA				
- Perkins Paper Candia (Que)	50	50	Ledger Cup Stock Envelope	Washing
- Scott Crabtree (Que)	175	75	Ledger	Washing and Floatation for Effluent
- Scott	40	40	Ledger	Washing
PRINTING AND WRITING GRADES				
USA				
- Bergstrom Paper Neenah (Wis)	140	125	Varied	Washing
- Boise Cascade Vancouvre (Wash)	240	30	Ledger Envelope	Floatation
- Diamond Corp Hyde Park (Mass)	150	125	Ledger Envelope	Washing
- Fitchburg Paper Fitchburg (Mass)	225	20	Tab Card Bleached Board	Washing
- Georgia Pacific Kalamagoo (Mich)	400	120	Ledger	Washing and Floatation
- Miami Paper West Carrolton (Ohio)	220	50	Printing Waste	Washing

Mill	Prod. Capacity TPD	Deinking Capacity	Type of Wash	Type of Deinking
- Newton Falls Paper Newton Falls (NY)	400	140	Ledger	Washing
- Potlach Pomona (Calif)	250	40	Ledger	Washing
- Ward Paper	80	45	Ledger	Washing
CANADA				
- Abitibi Throld (Ont)	260	110	Ledger Manifold	Washing

LINER AND BOX BOARD GRADES

USA				
- Celotex Corp. Quincy (Ill)	300	50	Coated Paper waste	Floatation
- Federal Paper Board Los Angeles (Calif)	140	-		Washing
- Georgia Pacific Pryor (Okl)	240	80	Magazine	Washing
- Hoerner Waldorf St. Paul (Minn)	750	75	Ledges Envelope	Washing
- National Gypsum Milton (Pa)	310	-	Varied	Washing
- National Gypsum Pryor (Okla)	215	-	Varied	Washing
- Pacific Coast Packaging Los Angeles (Calif)	140	-	-	Floation
- Pacific Paper Board Stockton (Calif)	-	-	-	Floatation
- Packaging Corp of America Macon (Ga)	65	-	-	Floatation

Mills	Prod. Capacity TPD	Deinking Capacity	Type of Wash	Type of Deinking
- Southwest Forest Snowflake (Ariz)	1200	200	-	Washing
- West Vacco Louington (Va)	1350	25	-	Washing

MARKET PULP

USA

- BJ Fibres Santa Ana (Calif)	150	150	Ledger Polycoated Waste Board	Washing
- Ponderosa Georgia Augusta (Ga)	100	100	Ledger Polycoated Waste	Washing
- Ponderosa Tennesse Memphis (Tenn)	100	100	Ledger Polycoated Waste	Washing
- Ponderosa Pulp Osih Kosh (Wis)	100	100	Ledger Polycoated Waste	Washing
- Pulp Reydeng North East Ft. Edward (NY)	200	200	Ledger Polycoated Waste	Washing