SHORT TERM SCIENTIFIC MISSION:

IMPROVEMENT OF EXISTING SITUATION OF RECOVERED PAPER PROCESSING WITHIN PAPER INDUSTRY

Short Scientific Report

Start Date: 19/03/2007

End Date: 19/06/2007

1. Purpose of the visit.

ASPAPEL has initiated a Sectorial Action Plan on Process Waste, aimed at developing new approaches for non-hazardous waste management in the Spanish Pulp & Paper sector (>90% goes to landfills) that provide higher value solutions and priorities within the European Waste Strategy. This Action Plan calls for reduced landfilling in favour of solutions that offer more sustainable usage of by-products and process wastes both within the sector and in other industries (cement, brickmaking, ceramics, plastics, etc).

The Plan contemplates measures of a legislative, technological, and economic character, as well as communication initiatives, aimed at analysing and compiling the best working practices and technologies in practice in several European Union member states. The Plan has a programmed duration of 2 years.

The Netherlands is one country where a certain number of activities related with recovered paper processing are carried out. Their recycling rate is very high, thanks to well-developed social, economical, technical and environmental matters. Several “know how” solutions have been developed and applied. These solutions could be applied elsewhere; however, to do so, the possibilities of applying such techniques first need to be assessed. The objective of this STSM is to create clear links between the two countries in order to evaluate possible weak points within the recycling chain, analyse them and give guidelines and growundwork for further development of activities and projects required to improve waste management in Spain.

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2. Description of the work carried out during the visit.

In order to evaluate the view on the possible future situation in Spain, the existing situation has been analysed and comparison with other EU countries is necessary to be able to conclude and to give certain recommendations for improvement.

Following activities has been carried out:

- Analysis and comparison of the paper and board recycling structure.

- A review of the research actions and projects carried out: application of deinking sludge in cement works; general application of sludge in other industries, such as in brick factories; revalorising coarse rejects for WDF (waste-derived fuel) or energy (different technologies); revalorising coarse rejects for other value added products; other possible experimental systems of managing added-value waste, alternatives to landfilling (composting, agriculture); landfilling costs, taxes and bans applied in compliance of the European Decision on Acceptance Criteria for Landfilling Wastes.

- Possible applications of solutions from the Dutch paper industry in Spain.

3. Description of the main results obtained.

The results of the Short Term Scientific Mission, taken from our experience exchange visits, are described below.

It is planned that these results should be included in a General Catalogue of BATs or Best Available Technologies for the management of non hazardous waste in the pulp, paper and board sector. The aim of this publication will be to respond to one of the most prominent needs of the sector in Spain with regard to waste management: the availability of reliable, contrasted documentation regarding the different forms of waste management available and the technical, economic and environmental implications of each.

This catalogue will be accompanied by a table showing waste suitability criteria, which will cover the suitability of each type of waste based on its physical and chemical properties for each technology or alternative management system.

By eventually drawing up a decision-taking tree, companies in the sector will be able to evaluate the most suitable form of management based on the characteristics and difficulties of the waste in question.

3.1. Overall situation of waste production and treatment in the Netherlands.

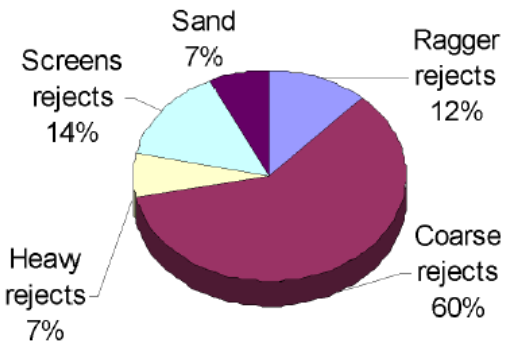
The paper and board industry in the Netherlands is made up of 25 production centres employing over 5700 workers. Production in 2005 was 3.47 million tonnes of paper and board.

Dutch manufacturing generates an income of € 2 billion. As far as production is concerned, packaging paper is the most important product with 56% of total production, followed by graphic papers with 40% of production and household and sanitary paper with 4%. Over 70% of total Dutch output is exported,90% going to other European countries.

75% of the raw material used in the Dutch industry is recovered paper and 25% comes from virgin fibre.

Only four of the 25 Dutch mills belong to domestic owners, the remainder belonging to foreign enterprises.

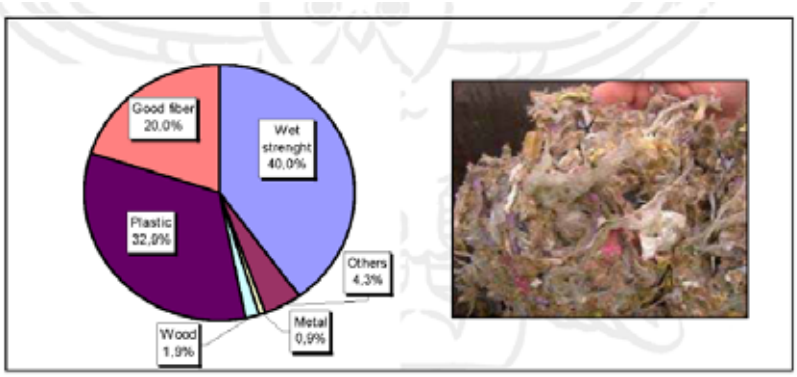
At present, landfill costs in the Netherlands are over 100 €/ton. DIP pulp reject production in the country stands at approximately 130.000 tonnes per year, including rejects from the pulper and deinking sludge.



This illustration shows the average composition of waste obtained in packaging factories using recovered paper as raw material in the Netherlands.

Pulper rejects account for the largest percentage - 60%.

As far as the composition of pulper rejects is concerned, the following illustration shows that the most abundant component is plastic with 32.9%. Moisture stands at around 40%.



Ash content: 7.8 %

* Source: Kenniscentrum Papier en Karton

This table shows mean, maximum and minimum compositions for each fraction of recovered paper rejects at Dutch mills.

The most significant variations can be seen in plastics. Biodegradable organic matter accounts for about 18%.

	Plastics [%]	Recyclable fibres [%]	Wet strength [%]	Ash content [%]
Max	55.71	27.04	50.88	11.7
Min	17.88	10,67	19.25	3.2
Average	34.22	18.13	39.18	7.8

* Source: Kenniscentrum Papier en Karton

The different management options used in the Netherlands for each type of waste are as follows:

For plastic rejects:

1. On-site energy revalorisation in biomass boilers.
2. Manufacture of secondary fuels for export. (The cement industry is saturated with specific MER hazard materials).
3. Landfills.

For de inking sludge:

1. Manufacture of value added mineral products.
2. Energy revalorisation in biomass boilers.

Other sludges:

1. Energy revalorisation in biomass boilers.
2. Landfills.

3.2. SCA de Hoop: technique for transforming recovered paper rejects into a WDF *"Waste Derived Fuel"* Fluff

I. Background.

The SCA de Hoop mill in Eerbeek, the Netherlands was visited by ASPAPEL on the 19th March 2007 as part of the programmed visits for the 2007 Sectorial Plan on Process Waste.

SCA de Hoop is a packaging paper mill whose raw material is 100% recovered paper and which produces 360.000 tonnes per year on two paper machines (PM4 & PM5), specialising respectively in Fluting (100 - 160 grs/m2) and Testliner (120 - 220 grs.). The industrial complex also has a corrugating machine and a co-generation plant. The centre has a total of about 200 employees (95 in production, 12 in cogeneration, 8 in dispatch, 45 in maintenance and 40 office staff).

The Cogeneration plant has a power output of 65 Mwe (3 gas turbines and one steam turbine). The operating scenario at present is one of increasing gas prices and lowering electricity prices. Self consumption stands at an average equivalent consumption of 17 Mwe.

The PM4 paper machine has a maximum speed of 470 m/minute and a total output of 110.000 tonnes per year.

The PM5 machine has a top speed of 900 m per minute with an annual production figure of 250.000 tonnes. Machine width is 4.58 metres.

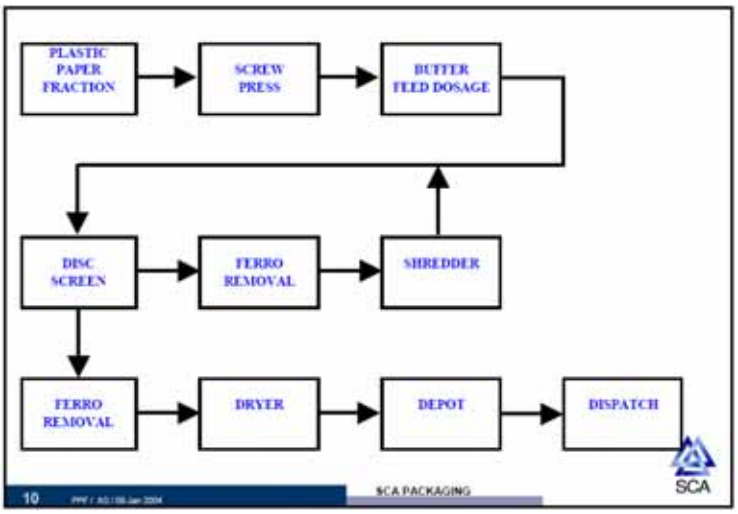
Capital investment for waste treatment was carried out in two stages: in 1999, a total of 1.8 million Euro were invested on the waste handling/transformation system, while in 2004, a total of 3.5 million € were invested on the waste drying system, which means that the total cost of the waste management system was 5.3 million Euro.

Waste generated from recycling recovered paper at this mill accounts for 12% of the total weight of raw material. SCA de Hoop calls part of this waste destined for fuel production PPF or *Plastic Paper Fraction*.

The waste management system does not require additional employees for its operation.

II. Waste treatment system.

The treatment system for the recovered paper rejects at this mill is based on a technique that includes some in-house designed items with which they produce a waste derived fuel (WDF) with a calorific value of 20-30 MJ/kg in the form of "Fluff" (the end fuel is not pressed but rather presented in small, loose, dry pieces). The manufacturer of the system seems to be Siemens. A flow chart for the treatment process is shown below:



Sources: SCA Packaging De Hoop

This system has a total treatment capacity of 31.000 tonnes per year, working at a processing rate of 3 tonnes per hour. According to its sustainability report, the mill treated a total of 23.078 tonnes of waste and dispatched 128 tonnes to landfill.

Recovered paper waste undergoes an initial selection stage in the raw materials yard to extract glass and larger metal particles, as well as other large particles. The pulper rope is not processed. The process has the following stages:

1 - Pressing in a screw press

2 - Storage in a silo and buffer feed dosage via belt conveyor

3 – Disc screening

Following these three stages, most of the reject runs through a metal extraction system and crusher before returning to the screening cycle.

The part which is accepted in screening goes through the following stages:

4 - Ferro removal

5 – Hot air dryer

6 – Product known as Fluffy stored in Depot

7 - Dispatch

Photographs of each of the stages are attached hereto in the annexe.

At present, the fuel is exported to Mexico "at zero cost" (we understand to be used in power stations or cement plants, but we have no confirmation of its final destination) via an external agent and making use of logistical synergies with other dispatches. We were told that the prospects are for an increase in demand for this type of WDF, which would mean an increase in prices and the attainment of profits for the SCA mill. Its traditional destinations were cement plants in Germany, and it is the external waste handling agent who deals with its "marketing". They are trying to obtain authorisation for it to be used by another paper mill (PARENCO) in the Netherlands that revalorises its waste by means of fluidized bed combustion. There is some background in the Netherlands of prohibition for on-site energy reuse of this type of waste in paper mills.

The annex hereto includes a more detailed explanation of the process, including the final composition of the end product and photographs of the system.

The waste going into the system is 55% dry and the WDF "Fluffy" obtained has 90% dryness. One of the cleverest solutions of the system is how they have solved the problem of reject drying. Rejects are dried in a drying tunnel using hot air heated in a very large heat exchanger. The heat comes mainly from the paper machine condensate although 6 bar steam is also present (see control diagram in annex). We were told that the main reason why they have used the condensate as the main source of heat and not the flue gas from the cogeneration plant was ease of design engineering and building compared to the other "theoretical" option. Although this is not waste heat, it does require a greater heat demand from the cogeneration or possibly improved performance. The end condensate seems to have a temperature of about 80°C.

The waste material runs through the drying tunnel on a belt conveyor under which a hot air is injected.

Extracted metals (2% of total waste) are sent to the iron & steel industry, which accepts them despite the slight plastic content. Glass is sent to landfill along with the pulper rope.

detail of the Fluffy end product

→ Stored end product

The waste management system does not require extra staff for its operation. At the time of our visit, no operators were working at the facility.

3.3. Norske Skog Parenco: Bubbling fluidized bed boiler for treating TMP virgin pulp and recovered paper process waste.

I. Background.

The Parenco mill belonging to the multinational Norske Skog produces a total of 460.000 tonnes of newsprint. The raw material it uses is 80% recovered paper fibre and 20% virgin fibre.

Norske Skog Parenco is the only newsprint producer in the Netherlands. It is situated in Renkum and started business in 1720. Its production consists of 88% standard newsprint with four different grammages between 42,5 and 52 g/m2. This type of paper is used for cold-set offset printing. Parenco also produces another type of paper called NorX59, designed for hot printing and flexographic printing. Their main markets are the Netherlands, Belgium, Germany, the United Kingdom and Ireland.

The Mill has two paper machines with a width of 856 and 852 cm each and a total of 420 employees.

With 75 to 80% of raw material being recovered paper (about 400.000 tonnes per year), rejects account for 2% of the total amount of raw material. For about 80% of its virgin pulp production, Parenco uses chips from the wood industry and 20% forest biomass with its corresponding Chain of Custody certification (PEFC-FSC). The Mill uses the thermomechanical pulp making system.

II. Waste treatment system.

General system data

Norske Skog Parenco has had a boiler for waste treatment in operation since 2004 (Bio-boiler K62). This boiler treats sludge and rejects from recovered paper and bark and other waste from its virgin pulp processing.

The amounts treated each year for each type of waste are as follows:

Type of waste	Tonnes treated
Sludge	120.000 t/a
Wood	10.000 t/a
Plastic rejects	10.000 t/a

The boiler handles 391 tonnes per day of dried solid fuel. It has a design capacity to accept 57% of dry waste, within a range of 50 to 60% of dry matter.

The boiler was manufactured by Kvaener. The source of non-wood solid fuels is as follows:

Type of waste	Percentage of mass
Sludge from the DIP pulp (primary + deinking sludge)	72%
Aerobic sludge from water treatment	18%
Plastic rejects	10%

The boiler works at a pressure of 65 bar and a temperature of 480ºC. Design pressure is 80 bars. Additional fuel (natural gas) needs to be used for initial start-up and/or to maintain the temperature inside the boiler.

The steam generated in the boiler is sent to a back pressure turbine where it is reduced from 65 to 3 bars, and the resulting low pressure steam net is consumed internally in the process. Total electricity production from the boiler is 28 MWe.

Fuel preparation plant

The fuel preparation plant is characterised by the following items:

1. Separation of ferro metals in recovered paper rejects.
2. Sludge and wood mixing.
3. Reject crushing and mixing with previous mixture.
4. Storage silo for resulting mix.

The fuel preparation system includes sludge, forest waste and recovered paper rejects, the latter being crushed prior to metal extraction and mixed with the first two items. Finally the mixture is stored in a silo from where it is fed into the boiler.

Recovered paper rejects fed to fuel preparation plant

Rejects crushed to 5-20 cms before being fed to fuel preparation plant

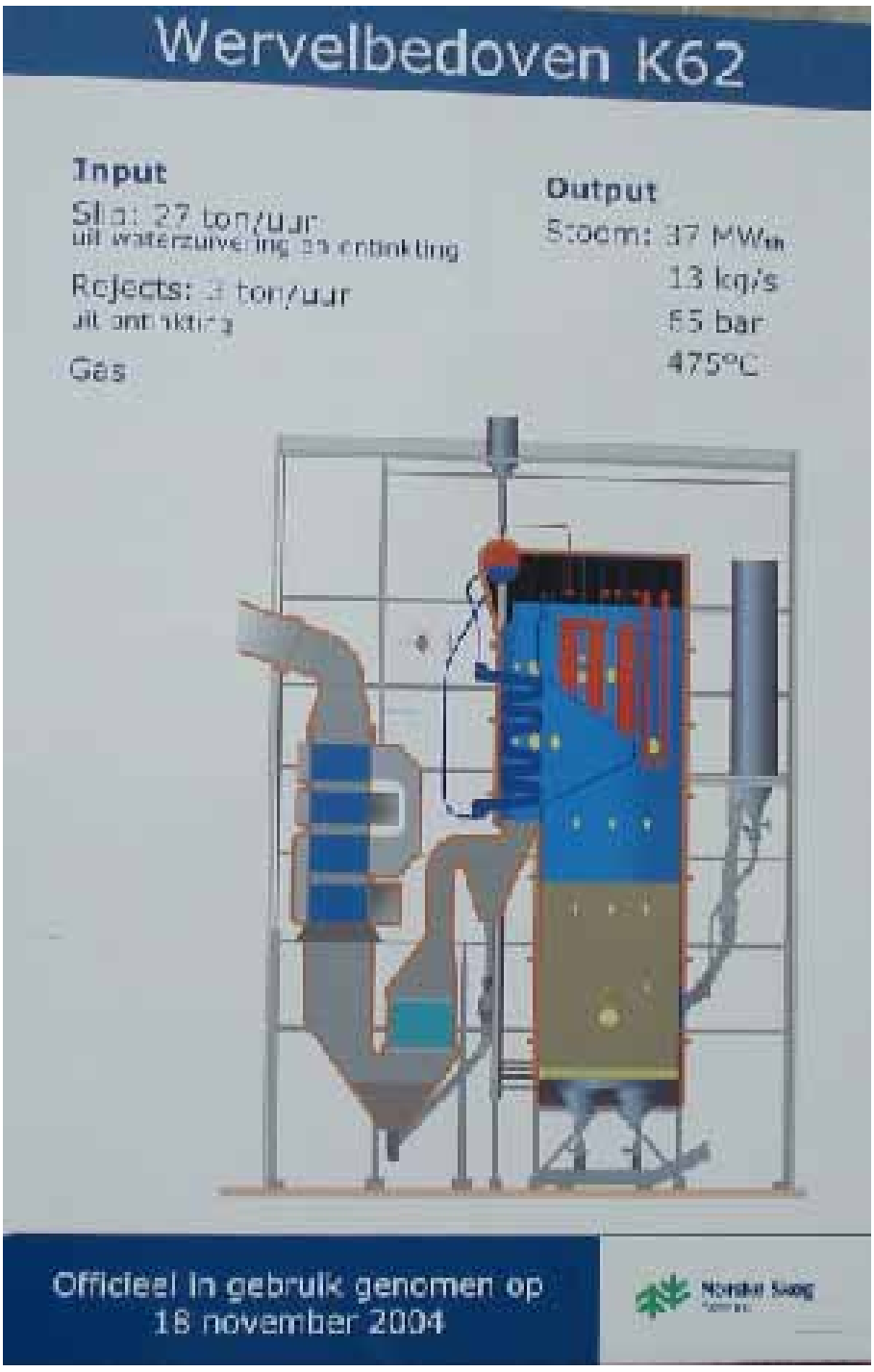
Recovered paper rejects before crushing

Fuel preparation area

Virgin fibre used for mixture

Separated metal storage

Primary + secondary + deinking sludges are mixed and sent to drying presses to reduce moisture and obtain 50-60% dry matter. They are then mixed with the rest of the components.



Stationary or bubbling fluidized bed boiler

NOx are reduced in the boiler by adding ammonium depending on temperature, which is injected directly in the mid-height primary air jet. The ammonium is delivered from a storage tank.

Secondary air is also injected from the bottom of the hearth to keep the bed fluidised.

The gas burners are used for start-up and to maintain the temperature inside the boiler.

The hearth needs to be cleaned once a week.

Following treatment, waste is reduced to 30% in the form of ash, which is sent to produce ashphalt and for ground improvement via an external company that deals with different mixtures (eco-minerals). Between 90 and 100 tonnes of dry ash produced each day. Ash is generated in two categories of fine and coarse depending on whether it is generated before or after the bottom or fly ash filters. Ash is transported below 90°C. It is re-saleable and classified as non-hazardous. They consider that the new REACH laws will not affect them as mineral products are excluded.

A sleeve filter has been installed at the end of the boiler to reduce emissions. At present particle emissions are no greater than 0,1 mg/m^3. They also have a gas scrubber.

Pictures of the boiler:

Boiler viewing window

→ Final fuel mix that reaches boiler

→ Waste and air fed to boiler

→ Detailed view of waste and air inlets

The waste treatment system is operated by 3 people per shift, as well as one maintenance engineer per day. 2 shutdowns of 1 week duration each are carried out each year for maintenance, mainly due to dirtiness in the superheaters.