Aylesford Newsprint

An SCA Forest Products and Mondi company

The paper mill at work

The Process

The Recycled Fibre Store

The Mill uses mixed recovered newspaper and magazines and segregated magazines which are stored in the Recycled Fibre Store prior to being loaded by one of our two shovels for continuous supply to the fibre preparation plant for pulping and manufacture.

The Recycled Fibre Store is a 72,000m2 warehouse storing all of the incoming recovered newspapers and magazines ready for recycling. It can hold up to 10,000 tonnes of material at any one time, sufficient to supply our 2 paper machines for more than one week's production. As the mill operates continuously it is important that good stock levels are maintained to keep the mill running. A team of five people deal with an average of 100 vehicles per day which deliver the recovered materials between 6.30 am and 9 pm and with one person working overnight ensures that the mill is kept supplied with paper.

Recovered newspapers and magazines arrive here at the mill in large vehicles with a bar coded delivery note; the vehicle is weighed and moves to the Recycled Fibre Store where the delivery note is scanned to record the details of supplier, weight and quality. The vehicle is then directed to one of four bays, each of which has the capacity to hold up to 2,500 tonnes of recovered paper. The vehicle is inspected during unloading for contaminants which, if found, are recorded on a handheld computer system for quality grading of the load. There are no paper sorting facilities and by working with suppliers good quality material is delivered. After unloading the vehicle leaves the store and may collect a load of newsprint for pressroom delivery.

The Fibre Preparation Plant

The Fibre Preparation Plant (FPP) uses the wood fibres in recovered newspapers and magazines to produce a clean, bright pulp for manufacturing newsprint. The plant has 14 stages which include: pulping, cleaning, screening, thickening, dispersion, bleaching, de-inking and washing.

Newspapers and magazines from the recycled fibre store enter two horizontal drum pulpers in the FPP from two conveyors. The pulpers are two large long rotating, sloping tubes and could be compared to two really big washing machines on a slow wash cycle. Water and Sodium Silicate are added and the pulper contents are then gently tumbled along the length of the pulper. The fibres swell loosening the ink particles and the tumbling action separates the fibres. Screening separates the fibres and water from large contaminates such as cans, plastic bottles and free magazine gifts which are ejected onto a conveyor belt for disposal.

The next, or second, stage of the cleaning is the cyclone screens which remove smaller contaminants. Lighter particles such as plastics are removed by screening and heaver items such as staples and glass are removed by centrifugal forces in the lower cone section of the cyclone screens. The following cleaning stage of the process is ink removal. Most newspapers and magazines are printed with oil-based inks, which are hydrophobic (they don't like water) and we use this characteristic to separate the ink from the paper fibres by adding soap. Compressed air is used to form soap bubbles and, because the ink sticks to the bubbles as they float to the surface forming a scum, the ink can be removed mechanically. Following de-inking there is further cyclonic cleaning to remove finer unwanted materials including plastics, sand and glass. Fine screens remove any remaining small contaminants such as glue particles.

Once fine screening is completed the disc filters remove water to take the consistency of the pulp from about 0.7% to 12% fibre in water. The water removed is recycled and used again in the FPP. The roll presses remove more water taking the pulp consistency to about 30% fibre in water. Hydrogen peroxide is all added to brighten the fibres and the material is heated to about 85oc. The pulp enters the dispergers to thoroughly mix and disperse any remaining contaminants and then on to the Brightening tower. The pulp enter the tower at the top and falls slowly to the bottom taking about 20 minutes allowing time to brighten the pulp. The pulp is diluted with water and completes a further stage of de-inking prior to washing and thickening to approximately 30% consistency. The pulp is thickened again and then diluted with clean recycled water for storage at approximately 12% consistency for later paper making.

The PM14 Paper Machine

Recovered newspapers and magazines received in the recycled fibre store at the mill have been converted into a clean pulp in the Fibre Preparation Plant and held pending manufacture in tanks as a pulp consisting of clean, bright fibres at 12% consistency. This pulp is now ready for paper production.

The pulp is pumped from the de-inked pulp storage towers and diluted to 4% fibre in water for a further six cleaning stages. During this phase very small amounts of blue dye are added to assist the final paper brightness, also a 'retention aid' to assist the fibres to form a paper sheet and a de-foamer to remove any remaining soap bubbles.

In order to achieve a good formation of fibres and therefore a strong paper sheet, the pulp is diluted with the addition of water. The head box is designed to distribute the fibres evenly across the 10 metre width of the machine and the work of this equipment is to inject the pulp upwards from the base of the machine into the forming section so that the fibres are trapped between two continuous woven nylon supports to form a sheet of paper. The continuous woven nylon supports are known as the inner and outer wires. Water is squeezed out evenly from both sides of the sheet with the help of a vacuum and a centrifugal force. When the sheet leaves the forming section it is saturated with water, but it has a good and strong formation. Paper strength depends on paper formation and to be strong it needs to have lots of fibres laying across each other in many directions and therefore, the more consistent the arrangement of fibres and the stronger the paper formation. The pulp is at this stage about 20% fibre to 80% water.

The sheet leaves the forming section wires and is picked up by a felt in next stage, the press section. Through the press section the sheet is only supported on one side by a synthetic felt which has a high holding capacity for water. The sheet is rotary pressed to reduce the water content by large rolls similar to 4 large mangles, which enables the paper sheet to pass through 'nips' (very small gaps) formed of matching twin rollers which force water out of the sheet. The felt and rollers draw water away from the fibre leaving a consistency of 50% fibre to water.

The sheet enters the dryer section of the paper making process. This part of the process is split into seven drying areas, each fabric carrying the paper as it snakes through rollers filled with steam. The area has an enclosed cover (hood) and hot air is pumped into the area above the rollers. The combined heat from the rollers and the hood evaporates water in the paper sheet and cooler wet air is exhausted, some of this is what can be seen from the motorway when driving past the mill. Paper leaving the drying section has a moisture content of just 9%, the standard amount for newsprint.

Newsprint is given a surface treatment and at Aylesford this is applied by using soft calendars, a pair of rolls, one with a soft cover, the other an oil filled thermo roll which applies heat like an iron.

One of the final stages of production is to monitor the characteristics of the manufactured sheet to ensure that customers' needs are being properly met. Once completed the sheet is tested for its specific weight, thickness, moisture content, mineral fillers, paper formation and sheet colour. The results of these tests are fed directly back into earlier manufacturing stages of the process to provide information to allow adjustments to be made to the process. The finished sheet is reeled onto machine or 'jumbo' reels at the end of the process. Each machine reel weighs approximately 40 tonnes takes about 1 hour to make and when finished is available to be processed to customer requirements.

Additional Mill equipment

Energy Plant

The combined heat and power plant (CHP) is owned by Npower Cogen and operated by Aylesford Newsprint. It burns gas to produce steam which is used for generating electricity and later for drying paper in the local paper mills. Electricity is supplied to the newsprint manufacturing business, a number of local businesses and external customers via the national grid. Steam is supplied for newsprint manufacture and to SCA Packaging. CHP plants, where both outputs are beneficially used, have much higher efficiencies that conventional generating plants and this plant is an important aspect of the Aylesford Newsprint business model.

The equipment consists of two G.E. Frame Six Gas Turbines, two Heat Recovery Steam Generators (HRSG) and a Back Pressure Steam Turbine. Fuel is burned in the Gas Turbine to drive the generators and produce electricity; the exhaust gases from the Turbine are routed to the HRSG where steam is raised to 61 barg at 480 °C. This steam is then used to drive a back pressure Steam Turbine where a further 13 Mwh of electricity is produced. The steam from both the exhaust and extraction ports of the steam turbine is then used in the papermaking process.

With both Gas Turbines running, the scheme produces typically some 93 Mwh of electrical energy and 115 tonnes/hour of steam. The Aylesford site requires approximately 66 Mwh of electricity and therefore some 27 Mwhrs is exported to the national grid. The exported power is beneficial to the national economy because it avoids the production of energy that could be raised in coal or oil fired Power stations whose efficiencies are significantly lower than those enjoyed at Aylesford.

The process residue combustor

The process residue combustor is designed to burn the process fibrous residue from the recycling process for steam production which is then used for both electricity generating and drying paper in paper manufacture. This secondary (process waste) recycling is a very important aspect of the mills energy

production although is does lead to our most significant emission to air. The combustion of paper waste is a direct replacement of fossil fuels by a renewable resource.

The combustor is a bubbling fluidised bed boiler generating 26 tonnes/hour of steam for use for electrical generation and papermaking process. The combustor is designed to burn 200 dry tonnes of process fibrous residue per day. The furnace is designed to meet the requirements for dioxin destruction (850 degrees C for a 2-second residence) with rapid cooling in the range 400 degrees C to 200 degrees C to prevent reformation. The cooled gases from the boiler pass to a bag filter assembly designed to provide high efficiency reduction of the particulate discharge.

About 200 tonnes of ash is collected per day and transferred to two silos; on discharge the ash is conditioned with water to control the dusting. Ash is directly discharged into vehicles without conditioning for supply for recycling.

The Water Treatment Plant

The water treatment plant treats water for recycling within the plant and cleans the water prior to discharge to the River Medway. The water treatment Plant processes approximately 16,500m3/day of used water, mainly from the Fibre Preparation Plant, PM13 and PM14. Treatment is normally in two parts though this can be extended to a third element.

Primary Treatment - Water is received from a buffer tower at a specified pH and at a controlled rate of flow. An aqueous solution of cationic polyacrylamide is injected before the water enters three parallel rotating drum filters to agglomerate the suspended solids and assist drainage. The number of filters in service depends on the level of demand. The separated suspended solids are discharged via a chute into a sump and the filtered water is deposited in the primary treated water sump. The temperature can be as high as 45 degrees C. The water needs cooling prior to discharge to the river Medway and is cooled to about 27 degrees C in a single pass open evaporative cooling tower.

Secondary Treatment - The plant consists of seven aeration tanks, the first two of which are smaller "selector" tanks. Oxygen is either obtained from a liquid storage vessel or an oxygen generator. Two clarifiers are used for separation of the activated sludge from the cleaned water for discharge to the Medway River. The selectors can be run anoxic or aerobic and the time in the aeration section of the plant is about 10 hours. Under normal operating conditions the aerobic plant typically removes 85% of the incoming COD and 98% of the BOD, giving BOD figures of less than 10mg/l and CODs of about 250mg/l. These values are considered normal for a de-inking mill producing newsprint. The suspended solid level is generally about 15mg/l.

Tertiary Treatment - There are no water recycling tertiary treatment stages but there is a drum filter available to treat solids from the clarifiers if required however this is normally by-passed. Solids separated in this process are transferred into a mixed sludge sump. The hard COD remaining in the final effluent is typically 90% lignin with the remainder being extractives, consisting of chemicals such as waxes, resins and oils, normally from adhesives attached to the recovered paper.