Waitakere Eco-City

# WAITAKERE CITY COUNCIL CLEANER PRODUCTION PARTNERSHIP PROGRAMME

# REPORT ON CLEANER PRODUCTION INVESTIGATION AT CARTER HOLT HARVEY TISSUE HENDERSON

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**Report prepared by:**
**James Andrews**
INDUSTRY AND ENVIRONMENT LIMITED

# TABLE OF CONTENTS

## 1.0 INTRODUCTION

Carter Holt Harvey Tissue has agreed to take part in Waitakere Eco City's Cleaner Production Partnership Programme (CP3). Objectives of this programme are to help establish Cleaner Production in Waitakere industries by:

- Providing information on how to establish an ongoing Cleaner Production programme through the CP3 workshop and folder;
- Providing the services of a consultant to offer site specific advice.

Waitakere City also sought to obtain waste audit information during the course of the consultant's involvement to assist with its strategic waste management planning. This information is also useful when establishing a Cleaner Production programme.

## 2.0 BACKGROUND

Carter Holt Harvey Tissue operates from two sites in Henderson: Henderson Valley Rd and the Concourse. Main activities are:

- Manufacture of toilet rolls, paper towels, and printing of polyethylene plastics (Henderson Valley Rd);
- Extrusion of polyethylene to produce plastic bags, sheet, film (Concourse).

## 3.0 PURPOSE OF REPORT

The purpose of this report is to provide a preliminary assessment of Tissue's operation and suggest:

- Areas in which improvements in environmental performance may be investigated; and
- Areas of special consideration for establishing a Cleaner Production programme.

It is intended to thereby stimulate discussion internally, rather than to solve specific waste generation or environmental problems. This is the function of the Cleaner Production programme.

## 4.0 METHODOLOGY

An initial meeting was held with key staff in which the Cleaner Production approach was explained, along with the aims of the Cleaner Production Partnership Programme.

A walkthrough was conducted on 2 May 1996 in which main production processes were inspected. These included:

- industrial towels department
- inward goods
- store
- slitting
- printing

- finished products
- film

## 5.0 RESULTS

## 5.1 INDUSTRIAL TOWEL DEPARTMENT

### 5.1.1 SOLID WASTE MANAGEMENT

Solid wastes produced in this department are separated at source into:
- kraft for recycling;
- tissue for recycling;
- miscellaneous waste for disposal.

These are stored in wheeled bins which are emptied several times daily.

### 5.1.2 HOBEMA C-FOLD TOWEL

The Hobema C-fold towel system is used for the manufacture of individual C-fold towels. The system incorporates stages of unwind, cutting, embossing, packing and casing.

Operation of the line has been sporadic, having initially been operated for 3 weeks before being shut down for eight months. After that time it had been run before Christmas 1995 and on three days since, but was then idle. The area around the line was fully illuminated.

The system utilises 100% of the web width, with wastage occurring during set-up and from breakages. The web is not run down to the butt because of the risk of web breakage. This represents about 10 kg of material which cannot be used, with an overall waste factor of around 6.5%.

The wrappers which bind the packs of towels utilise a glue which is not repulpable at the mills. Wrappers from defective packs therefore cannot be recycled.

Malfunction during casing can halt the whole production line. The problem mainly results from defective gluing of the UEB cases. A recent inspection by the Hobema operator revealed five cases out of twenty-five to be defective. Previous cases supplied by Kiwi Packaging were less problematic.

Staff from UEB spent a day on site investigating, and were looking into using an air gluing system to achieve more controlled gluing. At the time of the CP walkthrough this was yet to be installed at their factory. Other efforts to improve quality control were not successful at that stage.

Dust from the paper has been a problem, but has improved since installation of scrubbers.

Breakdowns are frequent, and half a shift in down-time is allowed for per week.

### 5.1.3 ROLEXINA UNWIND SYSTEM

The Rolexina is a two-roll unwind system, in which one or two reels of tissue are unwound, the edges trimmed, and rewound onto new cores. The ‘log’ as it is then known is mechanically cut into individual rolls of tissue.

Minimum web trim for the Rolexina cutting system is 25 to 30 mm per side. This equates to about 25 kg per 850 kg reel, or about 3% of the web width. Reduction of this web trim width does not appear possible with current plant.

The widths of the reels used vary, resulting in the variable utilisation efficiency. Standardisation of the web width may allow for improved utilisation.

The single colour printer Rolexina uses water based printing with 3-5% methylated spirits to aid drying, and a mixture of methylated spirits and acetate for cleaning.

A series of standardised job cards is used to check specifications for each production run, with any variations to these listed on a notice board adjacent to the line.

The need to cater for five different core sizes requires additional time and adjustments that is said to cause waste and frustration. Standardisation of core sizes has some potential to reduce these. The most commonly used core sizes are 6 inch, from the No.2 machine at the mill, and 8 inch, from No.1 and No.3 machines.

The Rolexina cannot use two single ply rolls if they vary from specification. Even with on-specification materials, matching speeds between the two reels is a problem. It was planned to change to a single ply in the near future.

Packaged rolls are assembled into pallet lots and covered with a layer of plastic to prevent UV damage during transport. The complete pallet is then clear-plastic wrapped.

### 5.1.4 CORE MANUFACTURE

Around 85% of cores are manufactured in-house. Three reels of kraft are unwound and bonded with EPA glue to form the cores. Most losses occur on start-up, but once running, a smaller amount of waste results from the top layer and the butt of the reel. Waste is compacted and recycled. Overall waste proportion is about 4%, filling two bins per day.

The glue used had been changed within the last month of the site visit. The previous glue grew fungi after six months of storage.

## 5.2 INWARD GOODS AND STORE

### 5.2.1 HANDLING

Between the mill and inward goods, reels go through several handlings:

- off paper machine
- into ground trolley
- through auto-wrap station
- tilted on end
- clamped, delivered to store
- railside
- into wagons or trucks
- shipped off truck or out of wagon (dragged until picked up by clamps)
- stored

In addition, there are perhaps another two handlings internally.

Depending on the care with which the forklift driver manipulates the clamps, a variable amount of damage is done to the outer layers of the reel.

### 5.2.2 BALING STATION

Kraft for recycling is stored here and baled. The wrapper on reject logs from the Rolexina line must be removed as it is not recyclable. If there is no labour available to do this, the logs are not recycled.

## 5.3 SLITTING

The tissue winder produces little waste. Operation of the Dentex emboss and cut machine depends on the operator manually stacking and shuffling the product into the case. This is difficult, and may produce more wastage than an automatic system. Wastage occurs at the front and butt of the reel.

The lunch wrap winder produces waste that cannot be recycled because of grease proofing chemicals in the paper. A solvent glue is used and cleaning was previously done with kerosene, but super degreaser is now used and is found to be more effective.

The infold-towel machine is around 25 to 30 years old, and has not been rebuilt in 8 to 10 years. The wrappers are badly in need of maintenance and frequently break down. The machine would require 3 months to be rebuilt. Conveyors are powered from the main machine and are left running during lunchtime as there is no individual switching.

A small amount of wastage occurs off the reel and the butt in the heat embosser.

Wastes are separated at source into tissue, kraft and hardbins.

Lights are left on during lunchtime, as they have a half-hour restrike delay.

## 5.4 PRINTING DEPARTMENT

The printing department operates 24 hours a day, 5 days a week. Paper makes up 30 to 35% of printed media, with polyethylene film from the Concourse making up 65 to 70%.

Solvent based inks are used, and include denatured alcohol, methyl proxytyl, and ethoxy propynal. Current air discharges of solvent are at around 1 litre every two weeks. Solvent disposal is 6 drums per month. A solvent recovery washing system is to be installed and will eliminate the need for disposal of used solvent.

Caustic soda has been used for cleaning, but has not been totally effective. It will be replaced with recovered solvent.

The four colour press and six colour Olympia 756 do not blow trim. The Comexi slitter currently trims nappy outers which have been trimmed to a fine tolerance. The Comexi is capable of fine adjustment, and it is possible that an additional trim is not required.

The McDonald’s burger wrap is produced according to a high presentation standard, and requires trims of the front, back and sides of a sheet before being guillotined to size.

Main wastage occurs during set-up, adjustments, and staff meal breaks. Continuing to run during meal breaks by staggering break times has shown some results, with room for further improvement by sticking more rigidly to the operation regime developed.

## 5.5 FINISHED PRODUCTS

Finished products are stored in two warehouses. No obvious areas of wastage were observed in this area. The finished products are stored on multi-tier shelving units, or stacked on top of each other. This practice is said to not contribute to waste production.

The minimal lighting is on continuously over the entire area. The lighting units appeared to be efficient mercury vapour lamps. It is doubtful whether any cut-backs could be made in lighting use through the use of automatic switching, as forklifts are frequently moving stock in and out, and restrike delays would make this unworkable.

## 5.6 FILM

Film operates 24 hours a day for 5 to 6 days a week from the Concourse site.

Polyethylene is delivered as pellets. The extruder mixes, melts, and meters out the PE which is then blown out and cut into bags. Alternatively, flat sheeting is produced by cutting the continuous extrusion lengthways and folding it out.

Between 2 to 3% of the extruded width is trimmed. This is collected automatically and recycled through the process. Sub-grade offcuts are collected for pickup by an external plastics recycler. At the time of the site visit, new equipment was to be installed to eliminate trim in around three weeks time.

Water used for cooling is close to 100% recycled.

Cardboard cores previously used for winding flat sheeting on have been replaced with PVC cores. There are two standard sizes and 75% are returned, saving $75 000 per year. The dust problem associated with cutting cores has been alleviated, as the PVC dust is coarser and tends not to be suspended in the air.

## 5.7 WASTE PRODUCTION FACTORS

Overall, a number of factors determined the amount of waste produced. These are:

- Production process;
- Trim from web width;
- Loading/set-up/start-up;
- Joins and end of reel;
- Breakages/equipment breakdowns/maintenance;
- Specification of materials;
- Off-spec materials;
- Operational procedures;
- Operator experience;
- Production scheduling;
- Handling of materials.

## 5.8 ISO ACCREDITATION

Accreditation to ISO 9001 was achieved about one year before the time of the site visit.

A major part of the process was the preparation of operational manuals for all aspects of the operation. Input from all staff was sought, and the staff are continually encouraged to make suggestions as to how impovements could be made.

## 5.9 MONITORING, PROGRAMMES, COMMUNICATION

Water use is monitored on a daily basis, and waste production and utilisation are looked at monthly.

Quality control is reviewed on an ongoing basis as part of compliance with ISO 9001. Operational manuals provides a high level of flexibility and control over production processes.

Departmental meetings are held weekly. All levels of staff are kept informed by passing on main information from management meetings to the team members. The team briefings also provide a mechanism for production staff input, which can then be passed back up the system.

Site health and safety meetings are held monthly. A safety observation programme began operating in April 1996. One person per day is rostered to observe work and operational practices, and completes a checklist. This provides baseline monitoring on considerations such as the safe use of forklifts and human lifting.

Health and safety attitudes are thought to be continually improving. The last lost-time injury was 646 days before the site visit.

Notice boards are used for communication at both sites. A health and safety noticeboard is located at the Concourse, and in the cafeteria at Henderson Valley Rd. The Concourse site also has a 24 hour noticeboard for communication between shifts.

The quality systems department provides a follow-up to quality training.

An ergonomics programme was in the planning phase at the time of the site visit, with an initial report having been produced.

## 5.10 WASTE AUDIT INFORMATION

### 5.10.1 ENERGY USE

Electricity usage was not available at the time of draft report publication, but is expected to be available for publication of the final report.

Natural gas use in the period between 1/5/96 and 3/5/96 was 71 922 $m^3$

Propane gas deliveries between 22/5/96 and 24/4/96 amounted to 17 267 litres

### 5.10.2 WATER USE

Water use between 1/5/95 and 3/5/96 was:
- Henderson Valley Rd: 3 427 000 litres
- Concourse: 371 100 litres

Metering is through four meters at the Henderson Valley Rd site, and one meter at the Concourse site. Water usage is monitored daily.

### 5.10 .3 SOLID WASTE PRODUCTION

Unsorted waste production is around 225 tonnes per year. This is disposed of by Wastecare and Waste Management on an alternating basis.

Separated wastes for recycling is:
- Around 170 tonnes per year of tissue. This is recycled within the company at the mill in kawerau.
- Between 15 to 20 tonnes per year of kraft. This is recycled by an external recycler in Wellington.

### 5.10.4 HAZARDOUS WASTE PRODUCTION

Around 6.6 tonnes per year of waste solvent is disposed of. This will be significantly reduced with the introduction of the solvent recovery system in July 1996.

### 5.10.5 TRADE WASTE DISCHARGES

Trade waste discharge information was not available at the time of publication of this report, but is expected to be available for inclusion in the final report.

## 6.0 DISCUSSION

## 6.1 INPUT MATERIALS

The change to purchasing of C-fold cases from the associated UEB company has resulted in a production and waste production disadvantage. The benefits of purchasing within the group should be weighed up against these costs. It may be economically more beneficial to Tissue and the group of companies as a whole to purchase externally until the quality control problem can be solved.

The inability to recycle product packaging because of the glue content is likely a major cost in waste disposal and a detraction from environmental performance. This affects both the Hobema packaging and the wrappers on the logs, the latter being disposed of entirely if the wrapper is not removed.

Rolexina web width if standardised may allow for improved utilisation. This could be by ordering reels of specified width from the mill, or changes on the production settings at the mill.

The variation in Rolexina core sizes causes lost time and resource through additional set-up and adjustments. Changing this means either accepting reels of a reduced range of diameters, or from standardising the reel diameter at the mill. Possible limitations are:
- All required raw materials may not be available on the reduced number of core sizes;
- Standardisation of core sizes at the mill may require expensive equipment changes and require production to halt during modifications.

## 6.2 EQUIPMENT

When replacing equipment, due consideration should be given to the energy efficiency, reliability and tendency to produce wastage. Further considerations are the minimisation of hazardous substances in production processes and the nature of the waste and emissions. Generally speaking, replacement of equipment should produce an improvement in environmental performance through minimised waste production and decreased use of non-renewable consumables. This should be given equal consideration to other purchasing criteria.

Areas not in production need only a minimum amount of lighting, but some of these were seen to be fully illuminated during the site visit. Individual switching capability could reduce electricity use, but may require wiring modifications. The economic payback is better for areas that are not used for a lengthy period of time, as frequent switching consumes electricity at a greater rate than steady operation. Another consideration is the restrike delay. Of course, the cooperation of the staff is necessary for more efficient operation, and adequate training and education must back up any equipment modifications.

Reels are sourced from CHH mills, and go through several handling stages. To minimise moisture and handling damage, a tough reusable lining may be viable. The closed loop between mill and factory is ideal for a reusable packaging system, but the handling required for use and removal may not be practical either at the mill or the factory.

Generally, configuration of equipment should allow for individual switching , as is required for the infold conveyor in slitting.

## 6.3 OPERATING PRACTICES

Preventative maintenance could eliminate some of the equipment breakdowns, especially those of the infold wrappers. The importance of a regular preventative maintenance programme should be recognised and an allowance for it made in the production scheduling.

An inventory of materials that have a finite shelf life should be operated to ensure that they do not expire before they can be used. Additionally, the amount of materials stored at any one time could be reduced, and materials delivered only as they are required.

Start-up losses and adjustments at the beginning of a production run are a significant contributor to waste production. Executing longer production runs may reduce these losses, but may create complications for production scheduling, raw materials and finished product storage, and transport.

Damage to reels is a result of the number of handlings and handling practices. Most handlings occur off-site, so there may not be much scope for significant savings from

reduced handling on-site. However the importance of taking care during handling could be emphasised through staff education.

Waste minimisation awareness in general could be promoted through regular training, although this was not found to be a serious problem at either site.

## 6.4 WASTE MANAGEMENT PRACTICES

Most reject product is recycled on-site (polyethylene) or sent to the mill for reprocessing (tissue and kraft). While this would seem to be the best system for managing the waste, particularly as the material stays within the company, recycling has numerous costs associated with it, these including management on site, collection and transportation, reprocessing, and reshipping, and increased resource use as a result of these activities. These economic and environmental drawbacks should be taken into consideration when considering an overall waste management strategy.

In the case of polyethylene, the short transport distances and minimal reprocessing required are not of as much concern as the long distance transport required to recycle tissue and kraft. Recycling should therefore be looked at as the solution for wastes that cannot be prevented, reduced, or reused.

Uses for waste materials should be looked for internally before they are committed to recycling. Potential uses for waste materials are in non-critical applications where they are not subject to aesthetic scrutiny, such as internal protective packaging.

Adequate resourcing is required to enable the waste management system to function effectively. For example, reject logs collected for recycling are dumped if labour is not available to remove the wrapper. Provision of increased storage space or extra labour may be cost effective and reduce the amount of waste destined for landfill.

## 6.5 ISO 9001

The accreditation to ISO 9001 has demonstrated that these key elements are in place:

- Customer focus;
- Management commitment;
- Total participation;
- Systematic analysis.

Whereas ISO emphasises the satisfaction of the customer, Cleaner Production also measures environmental performance as a main indicator.

The organisation for quality includes a business plan incorporating management goals for achieving quality and management review of progress.

Company -wide involvement is as essential to Cleaner Production as it is to the quality management process. The systems developed for gaining staff input for quality would have the ability to be adapted for Cleaner Production, and in many cases, the

two are not separable. Employee suggestions together with vendor participation and the customer focus are the basis of developing a life-cycle approach to resource use and waste disposal.

Standard methods of analysis of both positive and negative aspects of performance have an emphasis on prevention and minimisation of variation. This regular review of indicators is also part of the Cleaner Production process, but uses other indicators.

## 6.6 DEVELOPING A CLEANER PRODUCTION PROGRAMME

A generic Cleaner Production programme consists of the steps of:
- Establishing environmental policy;
- Establishing a cleaner production team;
- Baseline monitoring;
- Setting objectives;
- Collecting detailed information;
- Generating options;
- Feasibility analysis;
- Implementation; and
- Monitoring and review.

Constant considerations throughout these stages are management commitment, communication, staff awareness, and appropriate resourcing.

### 6.6.1 ENVIRONMENTAL POLICY STATEMENT

Carter Holt Harvey Limited has already developed and adopted an environmental policy statement.

### 6.6.2 CLEANER PRODUCTION TEAM

The Health and Safety committee is to be the forum for the Cleaner Production team. The team develops overall programme goals which will be consistent with the environmental policy statement, and may include:
- Saving costs through reduced resource use and waste disposal;
- Ensuring compliance with environmental legislation and aiming to exceed these requirements;
- Reducing environmental risk and liability;
- Promoting a safer work environment;
- Reducing the use of hazardous substances;
- Reducing the use of non-renewable resources;
- Minimising the environmental effects products throughout their life-cycle;
- Involving all staff in the Cleaner Production programme;
- Promoting environmental awareness throughout the company.

### 6.6.3 BASELINE MONITORING

A complete environmental monitoring programme will include:
- Energy use;
- Water use;
- Raw materials use;
- Waste and emissions production;
- Inventory of hazardous substances;
- Compliance with legal requirements.

Much of this information will already be gathered routinely as part of complying to the Health and Safety in Employment, Dangerous Goods, and Resource Management Acts, and the Trade Waste Bylaw.

### 6.6.4 SETTING PROJECT OBJECTIVES

From the baseline information gathered, quantitative project objectives can be set. These must be:
- Understandable;
- Specific and quantifiable;
- Acceptable to those who work to achieve them;
- Flexible and adaptable;
- Measurable;
- Achievable;
- Supportive of the overall company goals, including the environmental policy statement.

### 6.6.5 COLLECTING DETAILED INFORMATION

An assessment team is delegated to gather detailed information relating to the programme goals. Information needs to be gathered to answer the questions:
- What are the quantities and qualities of the waste?
- How much does the waste costs to replace, manage of site and dispose of?
- Where does the waste comes from exactly?
- Why is the waste being generated?

This is considered under option generation.

### 6.6.6 OPTION GENERATION

Once the questions above are answered, this leads to the next question, which is:
- What alternatives are there?

A brainstorming session with the CP team is a good place to start, by encouraging ideas that would otherwise not be considered. From there more likely options can be chosen for feasibility analysis.

Other options may be arrived at with the input of staff through noticeboards or suggestion boxes, as well as through more formal lines such as team meetings.

Particular problems could be opened up to staff input using a similar process to that used in developing the ISO manuals.

### 6.6.7 FEASIBILITY ANALYSES

Feasibility analysis should include:
- Environmental
- Economic
- Social
- Technical
- Legal
- Occupational safety and health
- Overall desirability for those who must live with it

Environmental feasibility can be evaluated by asking, will this project:
- Reduce environmental impacts?
- Reduce energy/resource/material/water use?
- Reduce toxicity of materials use?
- Reduce wastes and emissions?
- Improve occupational safety and health?
- Not just change the form in which the waste is produced?
- Reduce the toxicity of waste and emissions?

### 6.6.8 IMPLEMENTATION

Implementation of options requires coordination between different departments, and the information system must support this. The CP team is an initial forum for communicating between departments, but systems for exchanging detailed information between departments such as accounting and production planning are what is needed.

Changes in operational procedures need to be reflected in staff training, as well as in the operational manuals. To achieve maximum effectiveness, implementation of changes should be backed up with publicity throughout the operation to achieve staff cooperation and a feeling of ownership for the project. Posting of information on the noticeboards and updates through the departmental and team meetings should achieve this.

### 6.6.9 MONITORING AND REVIEW

Monitoring needs to record changes in baseline information, as detailed in Section 6.6.3, as well as indicators of the particular project.

The safety observation programme data collected could be expanded to include a waste observation programme including:
- waste generated
- quantity
- origin of waste

- reason for generation
- management method of waste

Factors observed to be contributing to waste generation could also be noted.

## 7.0 CONCLUSIONS

Overall CHH Tissue is an excellent example of an efficient and safe work environment. Management has shown progressive attitudes towards both the environment and occupational health and safety.

### 7.1 OPPORTUNITIES FOR CLEANER PRODUCTION IN MAIN PRODUCTION PROCESSES

As with any industry, the fact that wastes are being produced indicates that there are areas which could be improved, long-term if not short-term. They can be summarised in terms of input materials, equipment, operational practice and waste management practice.

The options for Cleaner Production recommended in this report may require detailed investigation to determine viability, while with others it may be immediately apparent that they are not worthwhile pursuing. These however are intended to offer an objective view on production and to promote discussion, rather than to be a final outcome.

### 7.2 CLEANER PRODUCTION PROGRAMME

The people involved with the operation of the process everyday are those that know it best, and it is they that are in the best position to find ways of improving environmental performance. That is why the emphasis of Cleaner Production is on staff participation from all levels.

The existing management structure is suitable as the basis of an ongoing Cleaner Production programme with little modification. Essential communication flows exist, as do manuals for control of operational procedures. What could be embellished is a link between different business systems such as accounting and production.

## 8.0 RECOMMENDATIONS

### 8.1 OPPORTUNITIES FOR CLEANER PRODUCTION IN MAIN PRODUCTION PROCESSES

It is recommended that the following areas be investigated for implementation as Cleaner Production options.

#### 8.1.1 INPUT MATERIAL CHANGES

- Quality control of C-fold cases improved by change of supplier;

- Adoption of glue for C-fold packaging which is recyclable;
- Standardisation of Rolexina web widths;
- Standardisation of Rolexina core diameters, reducing number of sizes from five to two;
- Check on Rolexina reel specifications.

### 8.1.2 EQUIPMENT CHANGES

- Consideration of relevant waste production factors when installing new equipment;
- Task lighting and individualised switching to ensure only areas in use are lit;
- Reusable packaging for reels to minimise damage during handling;
- Installation of switching on conveyors in slitting to allow for shutdown during meal breaks.

### 8.1.3 CHANGES IN OPERATING PRACTICES

- Establishment of a preventative maintenance programme for all equipment, with down-time to be allowed for in production scheduling;
- Inventory control of glue for cores and all limited life materials generally;
- Maximised production run sizes to reduce start-up losses;
- Reduced handling of reels to minimise damage;
- Waste minimisation training to improve handling practices and general awareness.

### 8.1.4 CHANGES IN WASTE MANAGEMENT PRACTICES

- Replace polyethylene protective packaging with reject product, and give preference to reuse waste materials internally before recycling;
- Ensure adequate labour and storage is available to allow for best management of waste.

## 8.2 CLEANER PRODUCTION PROGRAMME

It is recommended that where possible the following is done to establish an ongoing Cleaner Production programme at Cart Holt Harvey Tissue:

- Establishment of the Cleaner Production team using the Health and Safety Committee as the forum, and incorporating representation from all areas of production and support services;
- Establish more definite links between accounting and production departments;
- Incorporate environmental criteria into the process of information gathering, goal setting, project implementation, monitoring and review;
- Provide Cleaner Production training for all staff;
- Publicise management’s commitment to Cleaner Production;
- Publicise information on projects throughout the division through noticeboards and team meetings;
- Provide mechanisms for staff input such as noticeboards and suggestion boxes;
- Integrate efficiency and cost reduction projects into the Cleaner Production programme;

- Adapt the safety observation programme to include waste observation.

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The author would like to thank the staff at Carter Holt Harvey Tissue for their time and assistance in the CP3 study.

# EXECUTIVE SUMMARY

Carter Holt Harvey Tissue operates from two sites, at Henderson Valley Road, and at the Concourse. Main production is of tissue products such as toilet paper and disposable hand towels, and polyethylene plastic products such as bags and film.

CHH Tissue is participating in the Waitakere City Cleaner Production Partnership Programme. Waitakere City aims to promote the establishment of Cleaner Production programmes in Waitakere businesses through holding workshops an providing the services of a consultant to offer site specific advice.

This report is produced by the consultant and is intended to identify areas in which improvements in environmental performance may be further investigated, and also identify areas requiring special consideration when establishing and ongoing Cleaner Production programme at CHH Tissue.

A meeting was held with key production staff in which the Cleaner Production Partnership Programme was explained, and the operation in general discussed.

A walkthrough audit of main production areas was then performed by the consultant with guidance from site staff. Observations and information given by staff for each department is given in the results section.

Discussion is made in terms of the results for input materials, equipment, operating practices and waste management practices, as to whether environmental performance may be improved. The ISO 9001 system and other systems in place are compared to the process of developing an ongoing Cleaner Production programme.

It was concluded that CHH Tissue is overall well managed, but that there are some opportunities for Cleaner Production in the main production processes. It was also concluded that the existing management structure is suitable as the basis of a Cleaner Production programme with little modification.

Recommendations are made for Cleaner Production options for investigation, and are divided into input material changes, equipment changes, changes in operating practices, and changes in waste management practices. Specific steps are recommended for establishing an ongoing Cleaner Production programme at CHH Tissue.