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NATIONAL CLEANER PRODUCTION CENTRE SA

NCPC
national cleaner production centre
South Africa

CONTRACT REPORT

QUICK-SCAN SUMMARY REPORT OF RFF CANNING

086DG / HY7AGRO

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QUICK-SCAN SUMMARY REPORT OF RFF CANNING

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28 September 2007

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1. INTRODUCTION

1.1 Background

This report outlines the activities undertaken during a Prevention Quick Scan of the RFF Food Canning site in Franschhoek. The project is part of a Cleaner production Demonstration Project for the Agro-processing sector co-ordinated by the National Cleaner Production Centre (NCPC). RFF forms part of the Rhodes Food Group (RFG).

The Rhodes Food Group (RFG) comprises of RFF Foods, Swazican, Wonderland Foods and Rhodes Food Africa. RGF started from humble beginnings in 1896 to today whereby the group now has factories situated in Groot Drakenstein and Swaziland trading globally from North America through Europe to the Far East.

The RFF Foods (RFF) part of the Rhodes Food Group has been in the canning business for 90 years and is now an established global player. First it was a part of Anglo American Farms, which sold everything to the food department of Ferreira Group in 1999. And they gave RFF foods its name. The RFF Foods comprises now of RFF Foods LTD (export) and Rhodes Foods Africa (African market) which are both important players, both in South Africa and in the global markets. The Group's product range encompasses canned citrus, pineapple and deciduous fruit, jams and vegetables, juice concentrates, purees, dairy products and prepared meals for both local and export markets.

RFF produces a range of deciduous canned fruit, jams and vegetables for both the export and local markets.

Fruit - The cannery processes large volumes of premium deciduous canned fruit each year. Apricots, peaches and pears remain the company's main exports with the products being known for exceptional fruit quality, colour and texture.

Jams - RFF is one of the largest jam producers in South Africa producing a wide range of choice grade varieties for the market. The company remains loyal to the open steam kettle cooking method because this age old formula makes for a tastier and smoother textured jam.

Vegetables - The RFF range includes baked beans, butter beans, processed peas, tomato & onion mix, curried mixed vegetables and spaghetti in tomato sauce.

WONDERLAND - The fresh foods division started producing ready meals nearly 20 years ago. Today it is located at a new production facility in Groot Drakenstein. Wonderland is now the largest producer of its kind in South Africa, supplying the retail and catering industry with a diverse range of chilled and frozen ready-made meals consisting of:

- Soups
- Meats
- Poultry
- Pasta
- Sauces
- Desserts

All ingredients are carefully selected and prepared by a team of chefs to ensure the highest international culinary standards. Production is expanding to keep up with increasing demand, predominately as a result of exciting product development but also due to the markets demand for convenience meals.

The Wonderland Ayrshire Dairy

The dairy supplies a national chain of up market food stores with Ayrshire milk and cream. Whilst Wonderland Foods has a reputation for innovation its prominent position in the market is the result of the pursuit of excellence through every detail of its complex operation.

SWAZICAN - Situated in the scenic Malkerns Valley in the Kingdom of Swaziland.

Starting from modest beginnings in 1956 Swazican has now grown to be a leading supplier of canned fruit, juice and jams with markets around the world. In the summer months, from September through to April, Pineapples, which are grown on the fertile lands surrounding the factory, are processed. During winter the cannery processes citrus which is grown in the Swaziland lowveld - one of the best citrus growing regions in the world. A full range of jams is produced all year round. Major export markets include the UK, Europe, North America and the Far East.

SWAZI Can's range comprises:

- Canned citrus orange segments
- Citrus salad
- white, red and rosé grapefruit segments
- Canned pineapple, slices, pieces and crush
- Pineapple juice concentrate
- Jams and marmalades.

During the walk though of RFF in Franschhoek, the majority of the plant was closed down as the plant walkthrough occurred during the off peak season, and the majority of the processes were undergoing maintenance. The CP team concentrated on the cannery, and this will be the only process of RFF that will be looked at in this report.

1.2 Procedure

A consultant from BECO - Institute for Sustainable Business, Spencer Oldham, is part of a consulting team leading the Cleaner Production project. Support is provided by Thomas Bürki and Johannes Fresner of UNIDO. The project consists of two phases the Quick Scan (QS) and the In Plant Assessment (IPA). The Quick Scan aims to examine the potential for Cleaner Production to be implemented at the site. Manogaran Ram Reddi, Budu Manaka and André Page, all from the NCPC where present during the plant walkthrough.

The Quick scan requires close cooperation between the consultant and the participating company. Therefore a walkthrough was conducted at RFF by the consultant team and Cobus Visser, the Engineering manager for RFF. This was followed by request for information in the form of a questionnaire. The questionnaire was sent to RFF and a meeting was held with the engineering manager to fill in gaps.

2. COMPANY DESCRIPTION

2.1 Company Profile

The Rhodes Food Group (RFG) comprises of RFF Foods, Swazican, Wonderland Foods and Rhodes Food Africa. RGF started from humble beginnings in 1896 to today whereby the group now has factories situated in Groot Drakenstein and Swaziland trading Globally from North America through Europe to the Far East.

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The main season for RFF Canning is November through to End of March. The total annual turnover for the RFF Plant is approximately R220 million, with the employee numbers varying considerably from peak season (November – March) (1200 employees working 3 – 9 hour shifts per day, 6 days per week) to out of season (April to October) (100 employees working 2 9 hour shifts 5 days per week).

RFF produces a range of deciduous canned fruit, jams and vegetables for both the export and local markets. The total throughput of raw materials per annum is as follows: Peach 13,000 tons; apricot 5,000 tons, pear 2,500 tons; guava 600 tons; mixed vegetables 10,000 tons. The jam plant produces approximately 12 million cans per annum which equates to around 5,500 tons of canned jam. (this figure does not include the mass of the cans).

Table 1: Details of the company

Company Name	RFF	
Contact People	Cobus Visser (Lead process Engineer)	
Postal Address	Rhodes Food Group (Pty) Ltd, Pniel Road, Groot Drakenstein 7680,	Private Bag X3040, Paarl, 7620, Western Cape, South Africa.
Telephone: Fax: Email:	+27 (0)21 870 4000. +27 (0)21 874 1445 info@rfffoods.com	
Departments	Cannery Cold room storage labelling administration and head office laboratory	Research and Development Maintenance and workshops Wonderland Dairy Water treatment plant

2.2 Product Range

RFF produces a range of deciduous canned fruit, jams and vegetables for both the export and local markets. The total throughput of raw materials per annum is as follows: Peach 13,000 tons; apricot 5,000 tons, pear 2,500 tons; guava 600 tons; mixed vegetables 10,000 tons. The jam plant produces approximately 12 million cans per annum which equates to around 5,500 tons of canned jam. (this figure does not include the mass of the cans).

2.3 Customers and Suppliers

The customers and suppliers to RFF are as follows. The main customers are large local (South African) retailing chains such as Pick 'n Pay, Shoprite Checkers & Spar, and large international retailing chains in Australia, the far east through to North America.

The suppliers are all local farmers in the area, although this does stretch up to the Swellendam, Montagu and Ceres districts. The farmers are contracted on an annual basis to provide a certain volume of produce calculated on the area of the farm.

2.4 Location (Site Plan)

RFF is located in the Groot Drakenstein valley approximately 11 km north east of Stellenbosch and 14 km west North West of Franschhoek. The Groot Drakenstein valley falls within the Stellenbosch – Franschhoek wine lands and is one of the top farming regions in South Africa. The impact of the RFF plant on the surrounding community in small with respect to visual and noise impacts as no complaints had been received from the surrounding community during the past several months. The RFF plant can be seen in the figure below. At the Groot Drakenstein plant, RFF, Wonderland Foods and the dairy and cheese processing lines can be seen. The head office and administration offices are also situated on site. The RFG Dairy is situated approximately 1 km north and the waste water treatment plant for the Groot Drakenstein plant can be found here.

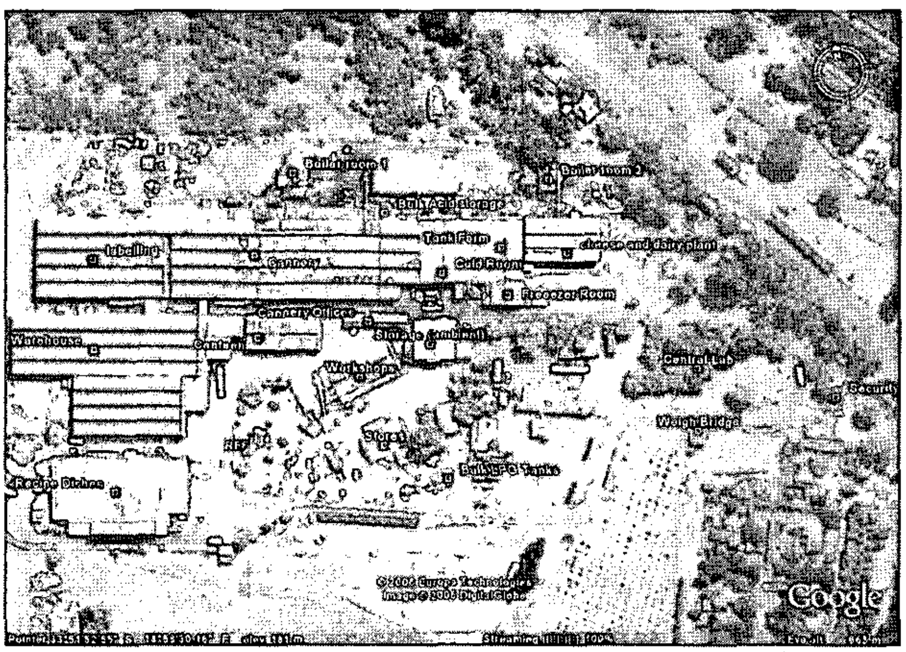


Figure 1: Google earth image of the RFF site in Groot Drakenstein

Figure 2: Google Earth image of RFF plant in relation to the Water Treatment Plant at the Dairy farm in Groot Drakenstein

2.5 Management Systems

RFF have several management systems in place at the Groot Drakenstein plant. RFF is not ISO 14000 certified, but the Wonderland plant (which is on site) does carry an ISO 9001 certification. RFF implemented a Health and Safety systems 3 years ago, which is now maintained by a private company, this was after NOSA[1] collapsed a few years back. RFF is currently audited throughout the year by various companies, mostly food related audits, but this does also include environmental concerns. Environmental audits have not been conducted on the RFF site in the past two years. RFF does have a Environmental Officer, Mr. Kobus Koopman, who is the lost control and SHE officer. This is a new appointment however as part of the company's Environmental policy.

3. PROCESS DESCRIPTION

There are four main processes take place in the cannery. These are Puree, Jams, beans and peas & canned fruit. Due to the fact that the RFF plant was shut down during the site tour, with only the bean line running, the process that will be investigated for this report will be the bean line in the cannery. The bean line forms part of the mixed vegetable input which in turn makes up approximately 10,000 tons per annum of raw material. However, I have included a small description of each product group of all

[1] National Occupational Safety Association http://www.nosa.co.za

the processes is given in this paragraph. These other process lines will not be included further in this report.

3.1 Puree

The fruit is brought in and placed in barrels, then checked for spots before production. The fruit is then washed and there is another visual inspection for rotten fruit. The checked fruit is then cooked and pulped and transported to the finisher. To increase the preservability, the fruit is processed at a temperature of 90 °C. After that the fruit is cooled to a temperature of 5-10°C. The last process step is cooking the puree before it is stored in a storage tank in the tank farm.

3.2 Jam

Puree is used as the base for the jam. The puree is put into the cooking pots where pectin and acid are added. After cooking the jam is put into one of the hoppers where it will be mixed until it is used for the can filling. After the can are filled, they are closed with a lid in the seamer. The next steps are cooling in a cooling basin, and palletizing for storage. After a storage period of 3 weeks the cans are labelled before dispatching.

3.3 Beans and Peas

After the beans/peas are received, they are soaked for twelve hours in large stainless steel tanks. They are then blanched and sent for visual inspection. The defects are removed, and the rest of the beans are transported to the filling machine whereby the beans/peas are manually loaded from the transportation belt into several hoppers where the beans/peas are filled into cans. The sauce is then added. The cans are closed and cleaned before being loading into the buzzy crate loader. The cans are cooked in a retort and then cooled. They are then unloaded and dried, before palletizing. After three weeks the cans have to be labeled and prepared for dispatch.

3.4 Canned peaches, pears and apricots

This product group contains many different kinds of product such as peach halves, slices and different types of syrups and small process steps. To simplify this process, only the main process is described. The empty cans are received, washed and marked. The fruit then passes an inspection line. The fruit will be sorted per product group. Some of the fruit will be blanched, graded, inspected, and sliced. After that the fruit is packed in cans and syrup is added. The cans will be cooked, cooled and dried before they are sorted. They are then palletized and transported to the warehouse. After 3 weeks they will be labeled and dispatched.

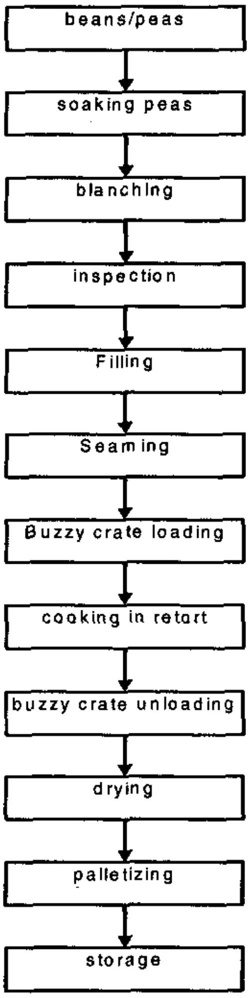


Figure 3: process flow diagram for Bean/pea line

4. SUB-PROCESSES

In this chapter, transport, storage, handling, utilities and waste generation will be investigated.

4.1 Transport

RFF does not have its own fleet of vehicles which are used for transportation. All goods transported to and from RFF are done by various third parties who are contracted on a seasonal basis. The means of transportation that is utilized is mixed (i.e. road, rail for local and ship cargo for exports). RFF does not have a special transport scheme in place as it is all outsourced to TFD which is a warehouse and distribution centre for finished product for the local market. The transport of fresh fruit is organised by RFF. RFG has an export office in London, UK, called RFI (Rhodes Food International) which takes care of all the export transportation contracts.

RFF does not have a transportation concept for employees, although the majority of the employees utilize public transport as this is the main means of transportation in Groot Drakenstein. RFF are looking into providing a public parking area for public transport outside the RFF main gates. This is not for the employees, but rather the neighboring area as the public transport tends to cause traffic congestion when passengers are offloaded.

4.2 Storage and Material Handling

Materials are received and kept in storage rooms before being entered into the processing plants. The internal transportation routes do have room to be optimized as the cannery line is several years old. The materials are moved from the storage areas to the plant my means of pallets and forklifts. RFF utilizes several forklifts which are powered by LPG. The internal moving of materials through the process is mostly automatic. These means of internal transport utilizes both water and mechanical means. The water transportation is used to move the beans from the soaking tanks to the blanching area. This is done by means of gravity and water flowing from the storage tanks to the blanching area.

There are several mechanical drives in the cannery which are used to drive conveyer belts and feed the cans through the process line. Several storage areas are utilized throughout the RFF plant. These are the Chiller rooms, the tank farm and freezer room. These are covered more in-depth in chapter 4.3.4. RFF does have a action plan in place for wastage occurring in the cannery line. This is covered in the 'Fruit-to-floor' action plan. This action plan was not available, however, at the time of writing this report.

Materials requiring additional preventative measures that were identified was the glass jar line. This is isolated from the main plant for health and safety reasons. The glass jars vary in size and volume and are sourced from one supplier, namely Consol Glass2. These glass containers are used in the jam process.

4.3 Energy Management

4.3.1 *Electricity Usage*

Table 1: The total utility consumption for the RFF plant[3]

[2] http://www.consol.co.za/

[3] Figures obtained from RFF Engineering department from meters throughout the plant, otherwise figures have been calculated by RFF Engineering Department

Total	Oct.	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Elec. Rand	R 203,945.00	R 203,452.26	R 247,541.09	R 316,354.87	R 338,096.63	R 283,578.43	R 255,509.23	R 271,418.26	R 268,090.73	R 234,132.31	R 236,108.88
Elec. KWH	648564	718137	841400	1183247	1300737	967458	1068730	983229	969827	799233	807797
Steam Rand	R 96,683.00	R 233,478.00	R 411,257.00	R 547,834.00	R 513,499.00	R 467,392.00	R 374,126.56	R 273,372.00	R 214,621.00	R 220,725.00	R 149,875.00
Steam Ton	887	2142	3773	5026	4711	4288	3217	2508	1969	2025	1375
Water m^3	37813	53033	92994	101403	118325	70990	53043	48844	33644	24814	39610
Effluent m^3	29694	27691	53818	52518	38010	41986	37784	31887	30489	37535	31909
Effluent %	79%	52%	58%	52%	32%	59%	71%	65%	91%	151%	81%

Cannery	Oct.	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Elec. Rand	R 106,620.00	R 83,753.64	R 158,949.93	R 206,350.80	R 219,641.27	R 195,381.55	R 171,446.06	R 173,215.63	R 176,611.21	R 136,052.94	R 138,573.67
Elec. KVA	907	734	1228	1506	1578	1653	1347	1344.44	1353.00	1149.40	1104.00
Elec. KWH	371787	282430	607185	825672	889455	685463	645393	659038.00	679506.00	478022.00	515171.00
Steam Rand	R 17,113.00	R 153,908.00	R 331,687.00	R 468,264.00	R 433,929.00	R 387,822.00	R 294,556.56	R 193,802.00	R 135,051.00	R 141,155.00	R 70,305.00
Steam Ton	157	1412	3043	4296	3981	3558	2487	1778.00	1239.00	1295.00	645.00
Water m^3	11265	26933	63807	70360	87086	50072	29842	20317.53	10206.24	3509.88	15906.00
Effluent m^3	8172	9905	33486	35687	22592	25459	20297	12829.64	8125.43	6307.11	10142.23
Effluent %	72.54%	36.78%	52.48%	50.72%	25.94%	50.84%	68.01%	63.15%	79.61%	179.70%	63.76%

% cannery makeup of total

	Oct.	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Elec. Rand	52%	41%	64%	65%	65%	69%	67%	64%	66%	58%	59%
Elec. KWH	57%	39%	72%	70%	68%	71%	60%	67%	70%	60%	64%
Steam Rand	18%	66%	81%	85%	85%	83%	79%	71%	63%	64%	47%
Steam Ton	18%	66%	81%	85%	85%	83%	77%	71%	63%	64%	47%
Water m^3	30%	51%	69%	69%	74%	71%	56%	42%	30%	14%	40%
Effluent m^3	28%	36%	62%	68%	59%	61%	54%	40%	27%	17%	32%
Effluent %	22%	19%	36%	35%	19%	36%	38%	26%	24%	25%	26%

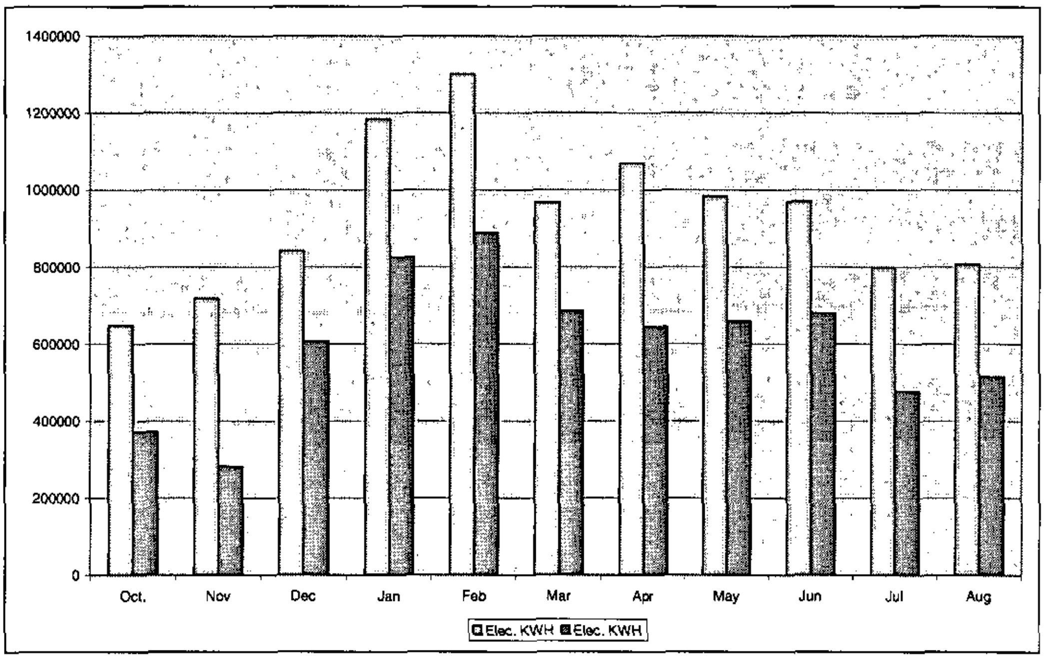


Figure 4: Cannery kWh vs. total RFF kWh per month

One can see from the table that the Cannery consumes almost 50% of the electricity for the entire RFF plant. These figures were compiled by the engineering manager for RFF. One should also notice the high peak consumption during peak season (Nov – Mar)

There is no overall energy management system for the RFF plant in operation as a whole. The boilers have rudimentary controls which can manage certain aspects of the boilers input and output. These are coved more in the following sub chapter.

4.3.2 *Process Heat*

RFF has 5 boilers on site. These are listed in the table below:

Table 2: Boiler Overview

				daily consumption			
number	size	fuel	status	peak	hrs/day	off peak	hrs/day
1	10 ton	coal grade A pea	primary boiler	12 tons	24	10 tons	24
2	8 ton	coal grade A pea	primary boiler	9 tons	24	3 tons	24
3	8 ton	coal grade A pea	secondary boiler	9 tons	24	3 tons	24
4	4 ton	coal grade A pea	secondary boiler	3.5 tons	24	3.5 tons	24
5	5.6 ton	HFO	back up boiler	no figures - run on an hourly basis when required			

The boilers are used to provide steam for the RFF plant. The steam is utilized mainly in the cannery, Wonderland and the dairy. The steam is around 175 – 180 ℃ and runs at 8 bar. During the tour around the cannery, several steam leaks were observed on the line.

The energy management systems in place for the boilers are rudimentary. One of the 8 ton coal boilers had actually managed to by-pass three of the final safety shut off procedures and achieved a critical failure. It was undergoing chronic repairs during the initial site visit. RFF engineering management did acknowledge that the steam and boiler systems had large amount of leaks and would be one of the first areas that they would look at.

4.3.3 *Compressed Air*

RFF have two compressors for the compressed air system. These are both Atlas Copco machines and work together to generate a accumulator pressure of 6 bar throughout the compressed air system. The compressor technical data is shown in table 3. These compressor work up to 7 bar to maintain a constant 6 bar pressure throughout the plant. These compressors are on 24 hours per day, although the running times vary between machines and season. The GA 55 runs 80% of the time in peak season and around 50% of the time in off peak season. The GA 30 runs 80% of the time in peak season and is usually turned off during off peak season.

RFF engineering management acknowledged that there were several leaks within the compressed air system, but noted that the leaks from the compressed air system were less than that of the steam system. No external steam audits or compressor audits have been conducted at the plant.

Table 3: Compressor Overview

number	Maximum working pressure WorkPlace	Capacity FAD (1)	Installed motor power	Noise level (2)
GA 30	7.5	96	30	65
	8	93	30	65
	10	80	30	65
	13	65	30	65
GA 55	7.5	165	55	69
	8	155	55	69
	10	144	55	69
	13	124	55	69

4.3.4 *Refrigeration*

With RFF being in the food industry, refrigeration and cold storage are very important to the everyday running of the plant. There are 3 main areas of cold storage on site (excluding the Wonderland plant). These are names Room A, a 8,200 m3 room running all year round at 5℃ from end of March to November and then 0℃ from November to March (durin g peak season). It is also interesting to note that the ambient temperature of the Groot Drakenstein area is higher during the peak season than the off peak season[4]. The installation and maintenance for the compressors is contracted out to a company called Coldex who run the compressors on a management system.

Room E can be dropped down to -7℃ if one requires shutting down the freezer room for maintenance purposes. This temperature will maintain already frozen goods, but will not freeze goods. Rooms A and E had new doors fitted, although the entrance to Room A comprised of a double door main up of the main door and then vertical plastic strips which were being used to reduce the air flow out of the entrance when the main door was open. The vertical strips were often being removed by the ingress of fork lifts. The Freezer room had an air blanket installed and operating on the inside of the main entrance.

Table 4: Compressor Overview

Storage area	Storage volume	season	Operating temperature range	Compressor #	Compressor Kw	Coolant	Management System
Room A	8200 m^3	Nov - Mar	0°C	1	175	NH_3	yes
Room A	8200 m^3	Nov - Mar	0°C	2	110	NH_3	yes
Room A	8200 m^3	Nov - Mar	0°C	3	110	NH_3	yes
Room A	8200 m^3	Nov - Mar	0°C	4	120	NH_3	yes
Room A	8200 m^3	Mar - Nov	5°C	1	175	NH_3	yes
Room A	8200 m^3	Mar - Nov	5°C	2	110	NH_3	yes
Room A	8200 m^3	Mar - Nov	5°C	3	110	NH_3	yes
Room A	8200 m^3	Mar - Nov	5°C	4	120	NH_3	yes
Room E	3500 m^3	Nov - Feb	0°C	1	75	NH_3	yes
Room E	3500 m^3	Nov - Feb	0°C	2	45	NH_3	yes
Room E	3500 m^3	Nov - Feb	0°C	3	45	NH_3	yes
Freezer	560 m^3	all year	-15°C	1	104	Freon	yes
Freezer	560 m^3	all year	-15°C	2	104	Freon	yes

It was noted during the walk through that the freezer room was empty, but still running at its operating temperature of -15℃. The door to the freezer room was not closing properly and a window in the rear of the freezer room was missing.

[4] Climatological data – Jan avg Temp 26.3℃; humidity 70% | July avg temp 17.5℃; humidity 80%

The tank farm consists of 85 vertical stainless steel tanks which are used to store the puree. The tanks are approximately 30,000 liters each and the room is currently being re-insulated. Several of the tanks have agitating motors attached.

4.4 Water Management

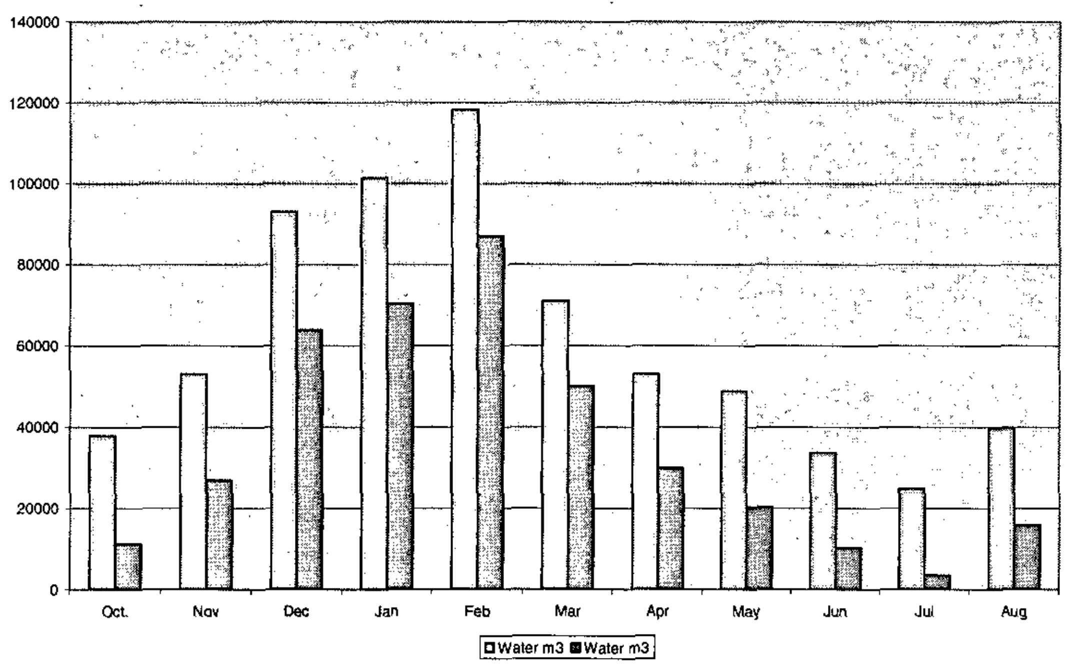
Water quality at RFF is critical for their production lines. RFF consumes approximately 700,000 kl of water per year which is sourced from the municipal water mains. RFF may not use groundwater for their production lines. RFF roughly has 70,000 tons of production which equates to a 10kl per ton product ratio. This is exceptionally high when compared to the European ratios of 4-5 kl per ton product.

The storm water drains around the site are identified and known to management, although they are not specifically visibly identified, nor protected. The external ground around the site is swept clean, although this is not the case within the cannery plant where hose pipes are used to clean the floors. There is groundwater beneath the plant and basic precautions are taken to protect this, such as bunded areas for chemicals.

A permit is not required from the local authority for effluent as the effluent from the RFF plant runs through the dairy which is owned by RFF where a water treatment plant is in operation.

4.4.1 *Water Consumption*

Figure 5: Water consumption Cannery vs. water consumption total



The cannery consumes on average around 50% of the total water consumption for RFF. Note the high consumption levels during peak season compared to out of season.

4.4.2 *Waste Water Treatment*

RFF has its own waste water treatment plant in the form of a farm which is situated to the north east of the site (refer figure 2). All the effluent from RFF (including Wonderland) is piped to the WTP at the dairy, using several pumps and gravity. Once at the WTP, the majority of the solids are removed using a slow rotating horizontal drum which allows the effluent to run through, but traps the solids. The solids are then removed and used a feed for livestock which are resident on the farm. The effluent is then piped through to an aeration plant and then onto the farms fields. The effluent does not reach the river which runs to the east of the farm. RFF do not pay for effluent charges, but rather pay an annual amount to the local authority for this. It is estimated that RFF produces approximately 420,000 kl of effluent per year, with the cannery contributing approximately 200,000 kl to this.

4.5 Waste Generation

Waste generations from the plant comprise of the following:

- Effluent
- Boiler ash

The effluent is sent to the WTP on the dairy farm and is covered in section 4.4.2 above. The boiler ash is removed from site by a local contractor for no charge. The contractor reuses the boiler ash in building projects.

5. FINDINGS OF THE QUICK SCAN

5.1 Data Evaluation: Estimation of CP Potentials

The data collected during the company visit were evaluated with the software-tool Eco Inspector. The CP potential of individual process steps, including those covering energy provision and storage management, was examined in accordance with the following criteria

Inputs:

- Are there any problem materials which are hazardous to the environment or to health?
- Are large volumes of raw, auxiliary and operating materials used?
- Is the level of energy consumption high?
- Are major costs incurred on the input side (materials or energy)?

Outputs:

- Are large volumes of (problematic) waste, special waste, wastewater, wastewater components or emissions generated?
- Are high internal/external preparation and disposal costs incurred?
- Technology: - Is the applied technology state of the art?
- What is the level of automation?
- Are there losses incurred through faulty batches or scrap?
- How are the systems serviced or cleaned?
- Are high costs incurred for maintenance, cleaning, stoppages?

Each process step was qualitatively checked on these criteria and was classified according to the following scale:

Table 5: Potential Points – Assessment of Potential Level for Each Criterion

Criterion not applicable to this process area, or no CP Potential	0 points
Moderate CP Potential anticipated	1 point
Significant CP Potential anticipated	2 points

The next step examines each sub-process as an entity according to the scale in Table 2 to determine the actual level of optimization already achieved; i.e. whether or not the CP potential is already exhausted. Thus the "relevance" of the identified potentials is described and a weighting factor is defined. This is a qualitative estimate and draws on the experience of the person conducting the Quick-Scan (expert opinion).

Table 6: Scale for Estimating the Level of Optimisation of the Current Process (weighing factor)		
Level of Optimisation "high"	Optimisation potential largely exhausted	0 points
Level of Optimisation "high to medium"		0.5 points
Level of Optimisation "medium"	Optimisation potential not fully exhausted	1.0 point
Level of Optimisation "medium to low"		1.5 points
Level of Optimisation "low"	Non-optimised process step	2.0 points

The product of the potential point and weighting factor indicates the current CP potential for each criterion point of each sub-process. The average of points for the individual categories (Inputs, outputs, technology and cost) gives a benchmark for the CP potential of individual process steps. This enables a rapid comparison of the sub-processes and facilitates selection of the processes for more detailed analysis.

5.1.1 *Assessment of the S&H, material handling, transport and energy management aspects*

The procedural principle for the processes is also followed when evaluating the aspects of safety, health, energy management, material handling, transport and storage. The point's average gives a benchmark for the level of CP potential and is used as basis for decision to determine whether or not the relevant aspects are to be incorporated in a more detailed analysis.

5.2 Results

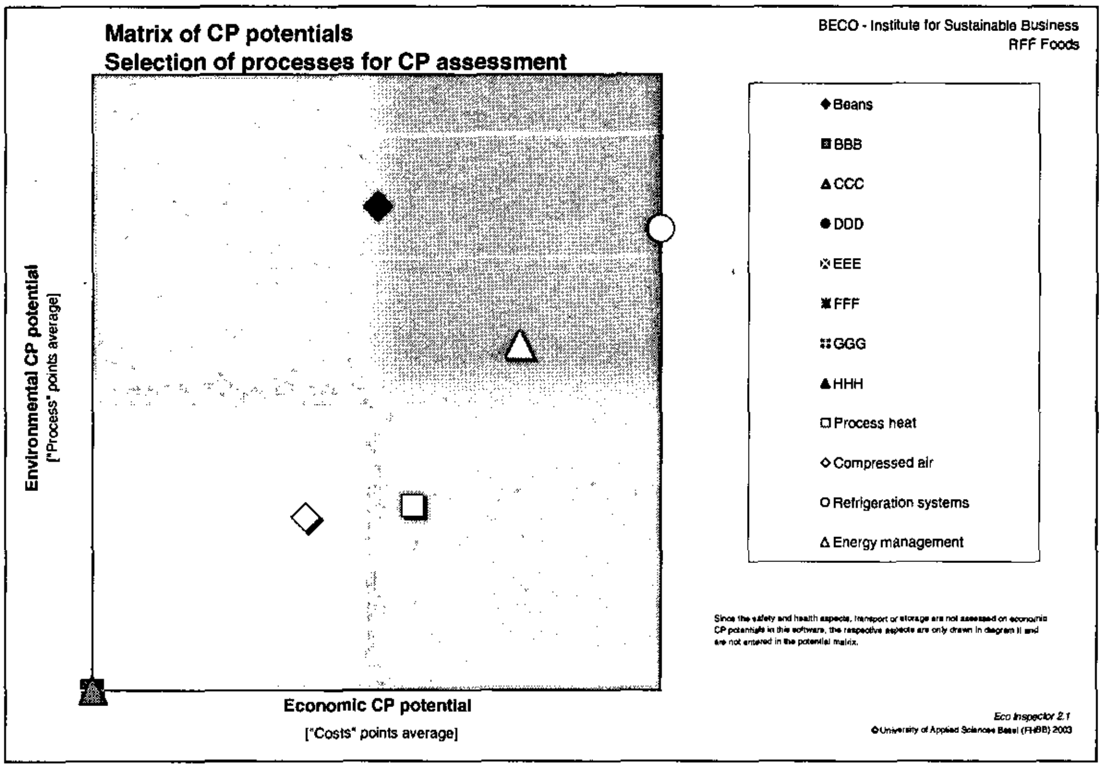


Figure 6: Matrix of CP Potentials

One can immediately see from the CP matrix that the areas of greatest opportunity are to be found in the refrigeration systems and the energy management systems. There are also good simple opportunities to be fond in the bean line, specifically with process water and the management of this.

6. DISCUSSION OF THE RESULTS

From the graphs and CP assessment one can see that there are several Cleaner Production opportunities that are immediately available to RFF. The Potentials that stand out are the refrigeration systems, energy management, process heat and compressed air. There is also a large potential for reduction of water consumption within the plant due to the current methodology used in the plant to clean up.

7. CLEANER PRODUCTION OPTIONS

Below are several CP options which could be implemented at RFF. CP Options however will be more concrete and have a financial feasibility study conducted on them after IPA has been conducted on the areas that have been identified.

7.1 Detailed Monitoring and Benchmarking

Operations that begin monitoring their resource consumption and actively set targets find reductions of between 2 – 5% of their resource consumption in the short to medium term. To this extent, we would recommend installing live metering of the main resource usage points. These include the steam, water and electricity supply mains and inputs into the Dairy, Wonderland foods, the Cannery and the Effluent treatment plant. In most cases existing meters can be retrofitted in order to fit the sender units (water meters).

7.2 Waste Product

We noted that there was a high incidence of good product falling to the floor at various stages in the process. A student assessment revealed that approximately 5.16Ton of the incoming fruit load was being sent to puree unnecessarily. This equated to an estimated loss in value of R3000 / day (~R250 000 / season). An intensive training program was recommended to prevent this loss in value.

7.3 Water Savings

Increasingly RFF will find itself in a position where resource consumption will need to be prioritised for reasons other than direct economic benefits. To this extent, investing in resource monitoring infrastructure and systems will be worthwhile in adopting a culture of resource conservation. Currently, this culture is not evident as the perceived cost of water at RFF is that of a free resource. An investigation into the indirect costs of water should be considered as energy, manpower and infrastructure is allocated for every m^3 utilized in the plant. Cleaning is vital to ensure food safety and is often a Critical Control Point within any food or drink operation. There are many ways, without compromising food safety, that companies in the industry can make their cleaning processes more efficient, more cost effective and less damaging to the environment.

7.3.1 *Water Pressure Control/Flow Restriction*

Significant savings can be achieved by reducing the water pressure at the point of use. Sometimes the water supply pressure is higher than it needs to be, or the pressure is variable. A reduction in pressure may also improve the cleaning achieved

7.3.2 *Automatic Water Supply Shut-Off*

Items or areas of plant that do not require water continuously can be isolated with a simple control system. This stops items such as sprays running continuously - often straight to drain. Successful switching methods include:

- limit switches;
- signals from existing process controls;
- signals from existing interlocks.

Trigger-operated spray guns on hoses can achieve significant reductions in water use because the flow stops when the hose is put down.

7.3.3 *Re-Use/Recycling Of Water*

Wash water is often flushed down the drain on the basis that it has been 'used'. Careful examination of the quality and availability of wash water, together with an understanding of water requirements elsewhere on site, may reveal opportunities for re-use or recycling. Wash water can often be used for the first wash down/rinse of floors or containers. In washing systems that have several stages, the water from the final rinse can be used as pre-rinse water, ie in the first stage. Typical savings in water use are 50%.

7.3.4 *Sprays/Jets*

Several of the spray/jets used in the blanching machine in the bean line were either missing or blocked. Sprays or jets can be used to direct or focus water for optimum effect while minimising water use. Spray and jet technologies have improved in recent years and the latest designs are less susceptible to blockage. New designs are also available with improved water efficiency while maintaining or often improving the cleaning effect. Sites with spray or jet washing systems would benefit from a review of the latest spray or jet technology. Typical savings in water consumption of 20% can be achieved by upgrading spray or jet systems. Nozzles are sometimes cleaned of scale, etc using a drill. This increases the nozzle size and results in a higher water flowrate. Maintenance practices should be checked to ensure that nozzles on washers, etc have not been damaged.

7.4 Energy Savings

In general, the amount of coal and electrical energy usage per tonne product (3.54 and 0.36 GJ respectively) is far higher than the benchmark (2.5 and 0.2 GJ respectively). Part of this can be explained by "economies of scale" as RFF cannery is the smallest producer. However, considering the lack of energy management systems we believe this is an area providing scope for considerable improvement in both economic (savings) and environmental (EMS and environmental reporting options) aspects of RFF's canning activities.

7.4.1 *Tariff Management, Load Profile and Peak demand*

The canneries average kW.h cost (including peak demand) is R0.21 which compares favourably to both the fruit cannery (R0.23) and industry standards using bulk tariff rates (R0.21 – R0.28). We would still recommend, however, installing electrical energy meters for the cannery, Wonderland Foods and the Dairy that will plot the load profile of the site and various operations. In the near future, energy supply companies will be offering Demand Side Management tariffs that will provide cost effective alternatives to the current bulk tariff utilized by operations that run over a 24 hr period. In fact, municipalities need to apply for a DSM tariff in their bulk energy purchase, therefore, it may be an option to persuade the municipality to apply for the DSM tariff in order to provide RFF with the billing option. We have noted kWh costs as low as R0.15 in operations that have incorporated DSM tariffs

7.5 Compressed Air leaks

The cost of compressed air leaks is the energy cost to compress the volume of lost air from atmospheric pressure to the compressor operating pressure. The amount of lost air depends on the line pressure, the compressed air temperature at the point of the leak, the air temperature at the compressor inlet, and the estimated area of the leak. An estimation of the leak area is based mainly upon sound and feeling the airflow from the leak. An alternative method to determine total losses due to air leaks is to measure the time between compressor cycles when all air operated equipment is shut off. Companies that actively monitor their compressed air leakage rate aim for approximately 10% leakage rate. Companies that do not monitor their compressed air leakage rate tend to range between 20 – 30% leakage rate.

7.6 Boiler Savings

7.6.1 *Insulating valves and flanges*

We noted both in the boiler room and also further on in the steam system, that large amount of valves and flanges were not insulated. A valve without insulation looses as much energy as 2-meter pipe of the same diameter. Similarly, a heat loss compared to a 0,6 meter pipe is valid for a non-insulated flange

7.6.2 *Install Removable Insulation on Uninsulated Valves and Fittings*

During maintenance, insulation over pipes, valves, and fittings is often damaged or removed and not replaced. Uninsulated pipes, valves and fittings can be safety hazards and sources of heat loss. Removable and reusable insulating pads are available to cover almost any surface. The pads are made of a non-combustible inside cover, insulation material, and a non-combustible outside cover that is tear- and abrasion-resistant. Materials used in the pads are oil- and water-resistant and can be designed for temperatures up to 1,600°F. The pads a re held in place by wire laced through grommets or by using straps and buckles.

7.6.3 *Insulation for Steam Traps*

Effectively insulate inverted bucket traps with removable and reusable snap-on insulation are available from suppliers. Thermostatic and disk traps should be insulated according to manufacturers' recommendations to ensure proper operation.

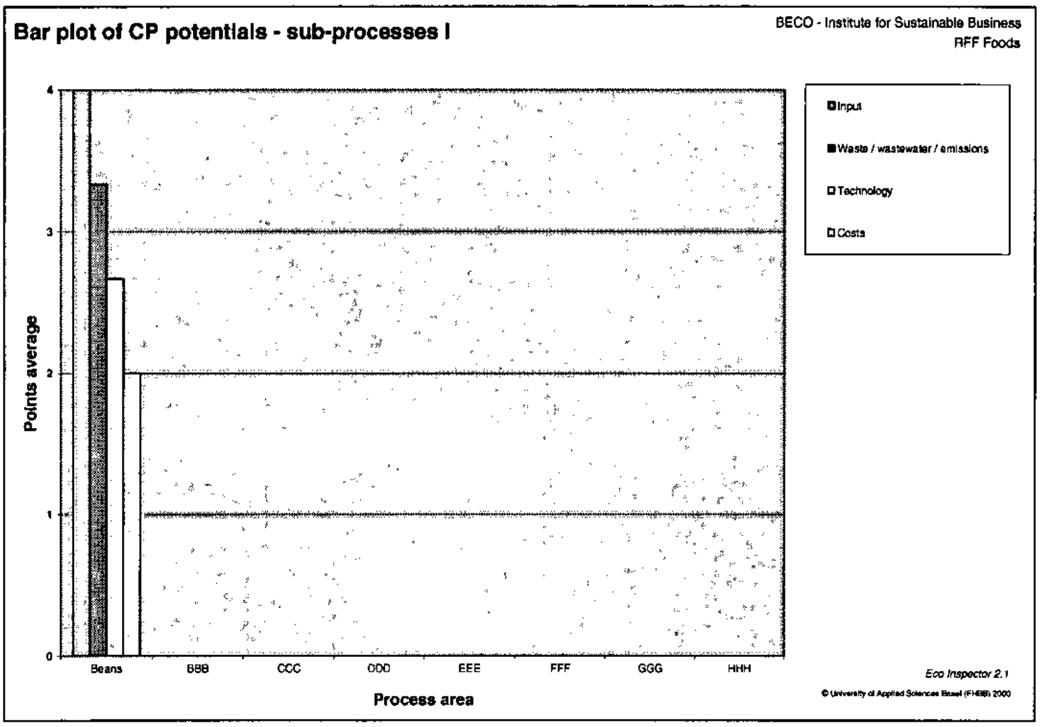
7.7 Management Systems

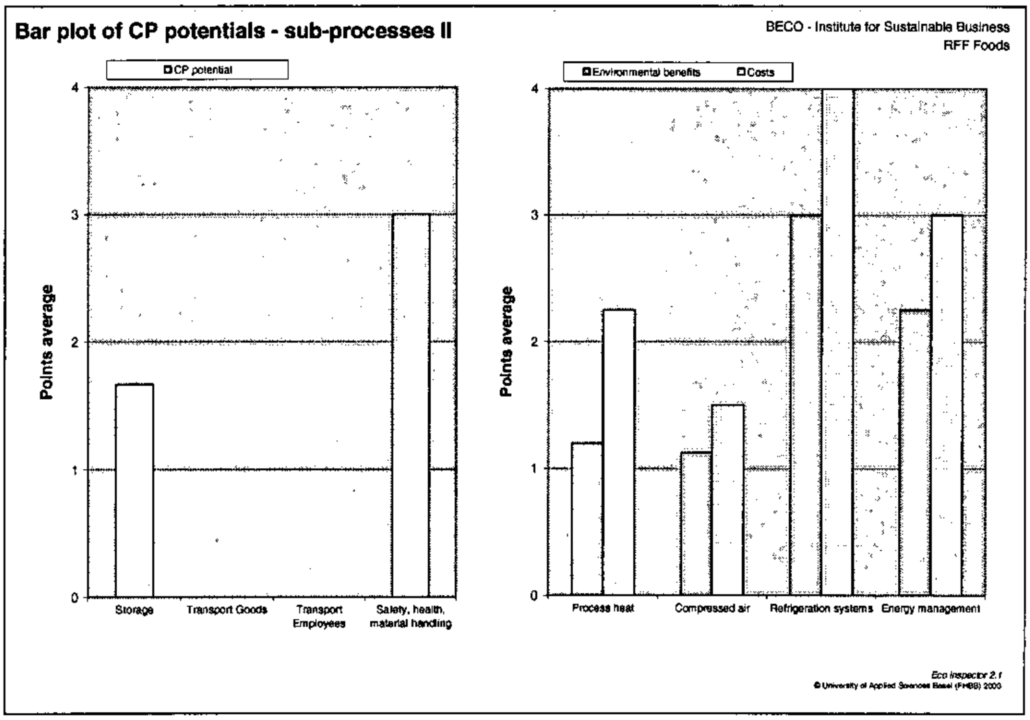
This section gives some general information about good management practices.
Energy / Water Audits: Because energy / water efficiency technologies are a rapidly changing field, you should designate a staff member to keep up with changes and you should consider scheduling an energy / water audit every two years. Accounting System: We would recommend that RFF tracks the resource usage per tones of product. This should include all the resource inputs in order to gain a holistic view of the operation. The resource accounting system should be compiled as a part of the corporate governance reporting.

7.8 Good Housekeeping

Often the biggest savings can be made through the easiest actions. There are many opportunities through no- and low-cost good housekeeping measures to improve the efficiency of cleaning operations. The main elements of a good housekeeping programme are discussed below. Where good housekeeping practices are implemented it is important to monitor the results to ensure that they are being maintained.

APPENDIX 1: ESTIMATED POTENTIALS OF COMPONENT PROCESSES





APPENDIX 2: SUMMARY OF RESULTS

Summary of results RFF Foods

BECO - Institute for Sustainable Business

Process	CP potential environmental benefits (process)												CP potential economic benefits			Estimation of CP potential*			
	Input			Waste / wastewater / emissions					Technology				Costs						
	(Eco-) toxic problem materials	Raw, auxiliary, operating materials	Energy consumption	Solid waste	Special waste	Wastewater (flow, amount)	Wastewater components	Airborne emissions	Status of technology	Level of automation	Faulty batches, scrap	Maintenance, servicing, cleaning	Input materials, energy	Disposal, preparation	Maintenance, stoppages	Points average of environmental benefits (process)	Points average of economic benefits (costs)	Environmental CP potential **	Economic CP potential **
P1 Beans	-	-	4	4	-	4	2	-	2	-	2	4	2	2	2	3.1	2.0	XXX	XX
P2 BBB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-
P3 CCC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-
P4 DDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-
P5 EEE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-
P6 FFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-
P7 GGG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-
P8 HHH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	-	-
P9 Storage	Moderate CP potential anticipated. Additional investigation recommended into storage and stock management.															1.7		XX	
P10 Transport Goods	No CP potential anticipated															0.0		-	
Employees	No CP potential anticipated															0.0		-	
E1 Process heat	Moderate CP potential for environmental benefits or financial savings. Additional analysis of the process(es) 'heat provision' recommended.															1.2	2.3	X	XX
E2 Compressed air	Moderate CP potential for environmental benefits or financial savings. Additional analysis of the 'compressed air provision' processes recommended.															1.1	1.5	X	XX
E3 Refrigeration systems	High CP potential for environmental benefits or financial savings anticipated. More detailed analysis of the 'cooling energy provision' processes urgently recommended.															3.0	4.0	XXX	XXX
E4 Energy management	High CP potential for environmental benefits or financial savings anticipated. More detailed analysis of the energy management system recommended.															2.3	3.0	XX	XXX
Safety, health, material handling	High CP potential anticipated. More detailed analysis of the safety, health and material handling aspects is urgently recommended															3.0		XXX	

* Estimation of CP potential:

X	low CP potential	Points average "environmental benefits" or "economic benefits"	0.0	to	1.3
XX	moderate CP potential	Points average "environmental benefits" or "economic benefits"	1.3	to	2.7
XXX	high CP potential	Points average "environmental benefits" or "economic benefits"	2.7	to	4.0

** The value of "Process points average" corresponds to the environmental CP potential, the value of "points average of environmental benefits" corresponds to the "Economic potential"
The calculation of the points average covers all positions with a value. Positions without CP potential (value = "-") are not taken into account.

Eco Inspector 2.1