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NATIONAL CLEANER PRODUCTION CENTRE SA

NCPC
national cleaner production centre
South Africa

CONTRACT REPORT

IN-PLANT ASSESSMENT REPORT OF EARLY BIRD FARM OLIFANTSFONTEIN PROCESSING

A DIVISION OF EARLY BIRD FARM (PTY) LTD

086DG / HY7AGRO

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IN-PLANT ASSESSMENT REPORT
OF
EARLY BIRD FARM OLIFANTSFONTEIN
PROCESSING

A DIVISION OF EARLY BIRD FARM (PTY) LTD

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28 September 2007

DOCUMENT CONTROL

Degree of Confidentiality:	Client Confidential
Title:	In-Plant Assessment Report of EARLY BIRD FARM OLIFANTSFONTEIN PROCESSING
Authors:	W Naicker, Lusanda Thomas, Henry Nuwarinda
Date of Issue:	28 September 2007
No. of Pages	

Issuing Organisation:

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Contract Name:	UNIDO Demonstration Cleaner Production Programme
Project Number:	HY7AGRO
Keywords:	Cleaner Production
Issue Number:	001
Copy Number:	1
Project Leader:	Ms Podesta Maepa

APPROVED BY:

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DISTRIBUTION:

Company	Contact Person	Copy Number
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NCPC (File: 086DG /HY5002X7AGRO)		4

FILENAME, TEMPLATE AND VERSION CONTROL

I:\NCPC\Efiles06_07\Sectors Projects\CSP Agroprocessing\UNIDO Agro\Report Format_EcoInspector QS.doc. Created 28 September 2007, from template:
I:\NCPC\Communications and Stakeholder Relations\NCPC Templates\Proforma Templates\Ext_Report NCPC.dot. Template revision 2, 3 May 2004.

EXECUTIVE SUMMARY

Early Bird Farm Olifantsfontein Processing, a division of Early Bird Farm (Pty) Ltd which in turn is a subsidiary of Astral Operations Ltd, was selected as one of the case studies for the Cleaner Production Demonstration programme currently being hosted by the National Cleaner Production Centre (NCPC) of South Africa. The Early Bird Farm factory in Olifantsfontein, Midrand, was the entity that was assessed.

The aim is to gather data on the production and waste generated in order to identify areas where cleaner production can be applied to improve profitability and enhance the environment. This report presents the outcome of detailed assessment findings on certain CP options chosen in the Quick-Scan phase.

The company produces fresh and frozen whole chicken; fresh and frozen chicken pieces, chicken offal, and poultry feed meal. The other divisions of Early Bird Farm (Pty) Ltd such as transport, farms, and marketing are not part of the scope for the Cleaner Production assessment. Health and safety measures at the company are well enforced.

The CP Option of decreasing potable water usage and effluent wastewater streams were investigated, and a number of cleaner production activities have been recommended in the action plan. The results of this can be benchmarked with the Best Available Techniques (BAT) as follows:

	Early Bird Farm			Denmark
Water Consumption	**Savings kl/day**	**Savings l/bird**	**Consumption l/bird**	**BAT**
During Quick-Scan			17.97	
Oct 06	403	2.07	15.9	
hosepipe savings	16	0.1	15.8	
condensate recovery	144	0.7	15.0	
Expected l/bird	**576**	**2.96**	**15.1**	**14.9**

With the savings proposed, it is possible to reach the BAT target of 14.9 l/bird water consumption. The process of continuous improvement together with 20 Keys will always be searching for improved efficiencies and sustainable benefits. With possible future savings as described in this report a new target of 14 l/bird could be achieved.

The annual saving in water cost is R886450 at R6.40/kl. The ten year saving assuming a 5% annual inflation rate and a 15% discount rate results in an NPV of R5.2 million.

	Savings/day Rands	Savings/yr Rands
spin chillers	2580	619186
hosepipe savings	102	24576
condensate recovery	922	221184
Total	3604	864946

The economics of refurbishing and redesigning the effluent plant with new screens, DAF Unit, repaired belt press is shown below. Assuming an inflation rate of 5% per annum and a capital expenditure of R9 million, the NPV, IRR, and payback for cash flows over a ten year period are as follows:

Capital Cost	9.00 million
NPV (15% discount rate)	9.05 million
IRR %	39%
Payback	2.77 yrs

The penalties that are being paid for high BOD and COD wastes in the effluent will be the revenue used to justify the capital expenditure for the effluent plant. The current penalty is R270800/month. The alternative is a **loss** of R3.2 million per year or an NPV of R16.9 million over ten years.

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1. PREFACE

This Cleaner Production In-Plant Assessment Report was performed as part of an awareness and pilot NCPC project by the South African National Cleaner Production Centre (NCPC - SA). The NCPC was established in 2002 within the framework of UNIDO/UNEP[1] Cleaner Production Centres

The programme has been designed for the needs of companies ready to analyze and optimize their internal business processes with a view to developing Cleaner Production (CP) techniques and to implement Environmentally Sound Technologies. This will allow the companies to reduce both their operating costs and the environmental performance, thus increasing their productivity and competitiveness. The project provides opportunities for staff training and technical consulting. It is targeted at executives and technically skilled employees (such as managers with a special brief for environmental affairs).

Further information can be found on the internet www.ncpc.co.za. Before a company is analyzed in detail, a *Quick-Scan* is usually conducted. The Quick-Scan is a short analysis which assesses the quality of the crucial processes, material- and energy flows in order to identify the *potentials* for CP. I.e. with the Quick-Scan the process areas with good optimising potentials are found and a possible focus for further analysis can be defined. On the basis of the Quick Scan, the company will decide whether or not and in which process areas an in-depth analysis (the CP Assessment) shall be conducted.

2. PROCEDURE

The company Early Bird Farm (Pty) Ltd, represented through its Director, Mr Len Hanson, declared an interest in conducting an in-depth In-Plant Assessment, for the CP Option of decreasing potable water usage and wastewater streams, performed at its premises as indicated by communication with the CSIR.

The IPA was initiated, at the company's plant in Olifantsfontein, Midrand. The following persons have been involved at different stages of the process:

From Early Bird Farm (Pty) Ltd.:

Mr Albie Muller	– General Manager
Mr Robert Allman	– Plant Engineer
Mr Joubert du Roubaix	– Quality Manager
Mr Chris Venter	– Effluent Manager

[1] UNIDO – United Nations Industrial Development Organisation
UNEP – United Nations Environment Programme

From the NCPC:

Mr Mano Ram Reddi - Project Manager
Dr Johannes Fresner - FHBB Basel/Stenum
Dr Thomas Burki - FHBB Basel

Consultant Team Members:

Mr Woody Naicker - team leader
Ms Lusanda Thomas
Mr Henry Nuwarinda

3. COMPANY INFORMATION

3.1 The Enterprise

The company Early Bird Farm Olifantsfontein Processing is a division of Early Bird Farm (Pty) Ltd which is a subsidiary in the Astral Food Group based in Johannesburg. The plant was started some thirty years ago. The company is domiciled at 10 Industry Road, Olifantsfontein, Midrand, South Africa. The company produces fresh and frozen chicken; frozen chicken pieces, chicken offal, and poultry feed meal. The other divisions of Early Bird Farm (Pty) Ltd such as transport, farms, and marketing are not part of the scope for the Cleaner Production assessment.

Earlybird Farm produces frozen, fresh and value-added chicken products to both the retail and food services sectors. Frozen primary and value added products are branded mainly under the Goldi brand, whilst fresh products remain under the Festive brand. The factory at Olifantsfontein processes approximately 200,000 chickens per day and produces 355 tones/day of chicken products and 22 tones/day of poultry feed meal. The factory employs some 1400 people, both permanent and contract, at the site with two shifts of 400 permanent employees per day. The plant operates on a two shift basis, 18 hours per day, five days per week. Maintenance and cleaning is carried out on weekends. Cleaning is also done in-between shifts. Early Bird Farm (Pty) Ltd has a turnover of R2.5 billion per annum.

The suppliers are mainly Early Bird Farm broilers, a few smaller chicken farms, Crown National for brine, East Rand Plastic, New Era Packaging for boxes, Makong Packaging for polypropylene, General Distributors for clear bags, Tristar Plastic for pallet wrap, and Linpac for fomo trays. Utilities are supplied by Eskom for electricity and Rand Water for potable water usage in the plant.

The customers include Festive Fresh Products, Goldi Chicken, Pick n Pay, EnergyOil and Meadow Feeds.

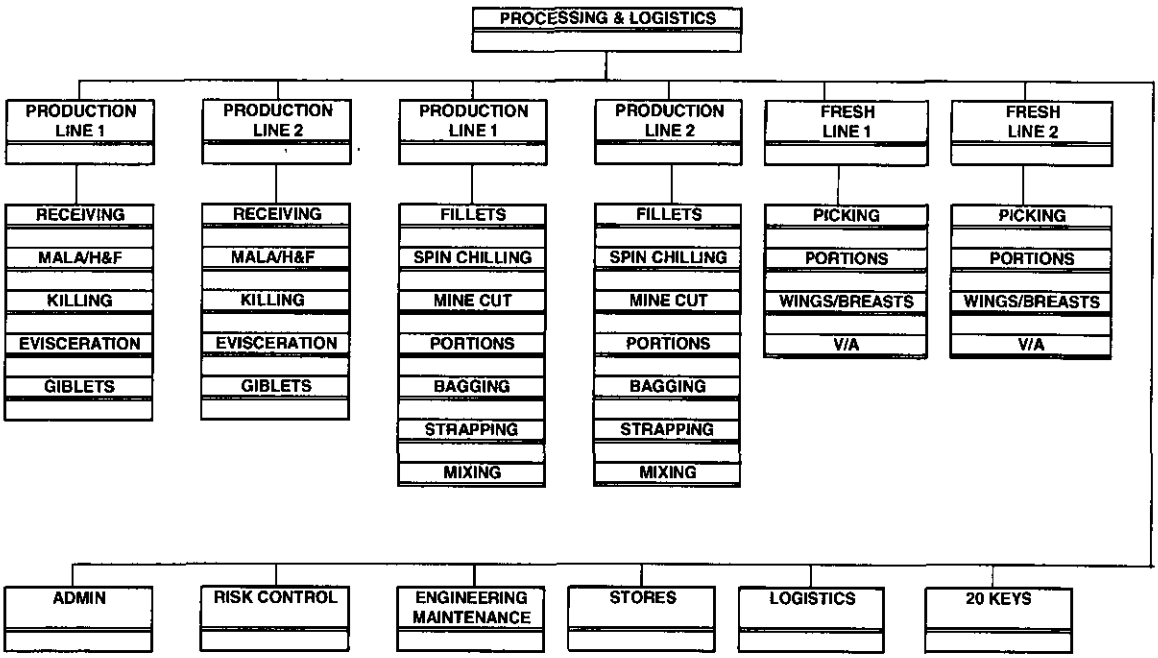
The company has an environmental philosophy that allows it to comply with most environmental standards. The company is audited quarterly, as per the South African regulation, by Alexander Forbes, and once a month for OHS audits. The company is also SABS 0330 and HAACP compliant. Early Bird Farm has initiated the ISO 22000 process with implementation by July 2007. There is also a health and safety management system implemented.

3.2 Manufacturing Processes

3.2.1 Overview

The process departments or sections of Early Bird Farm Olifantsfontein Processing are represented in figure 1.

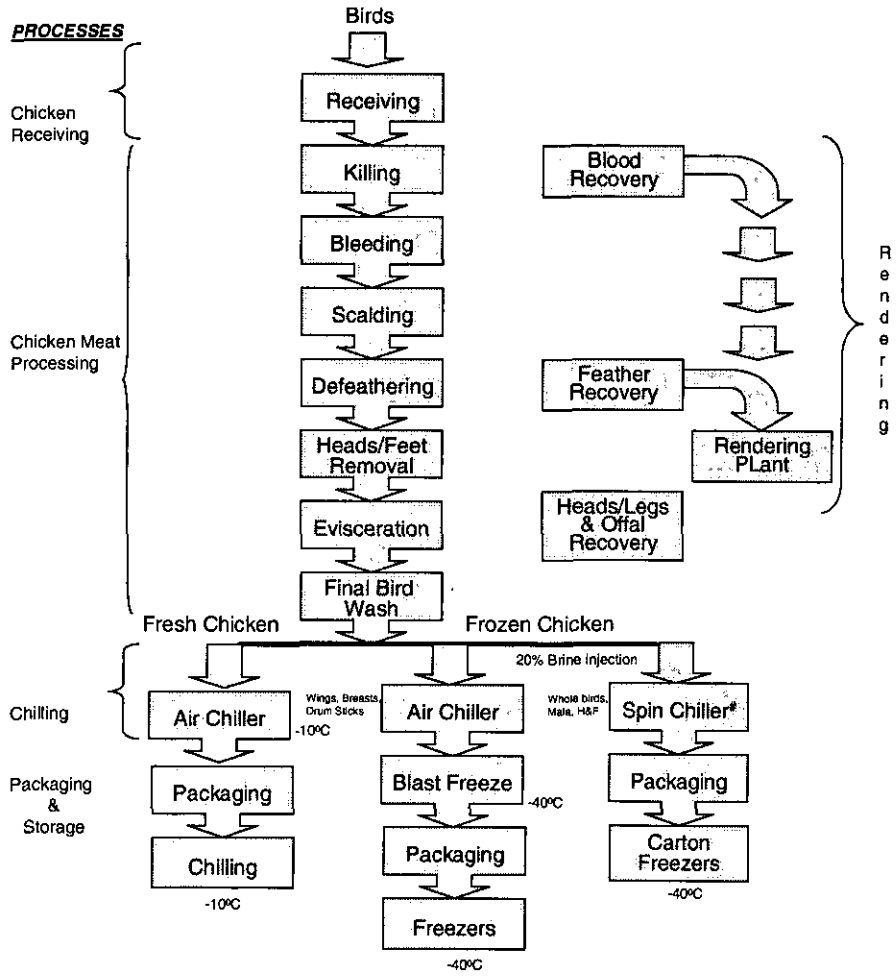
Figure 1: Overview of the various sections at Early Bird Farm Olifantsfontein Processing



The factory consists of two identical production lines till the chicken is separated into fresh and frozen whole birds and chicken pieces. The company is continuously improving and maintaining plant and equipment. For example, at the time of the Quick-Scan there were spin chillers operating, and by the time this report was written, air chillers were installed to replace the water consuming spin chillers. A 20 Key programme is being implemented by the company and a 20 Key team has been established.

3.2.2 Chicken Meat Processing

Figure 2: Process Flow Diagram at Early Bird Farm Olifantsfontein Processing

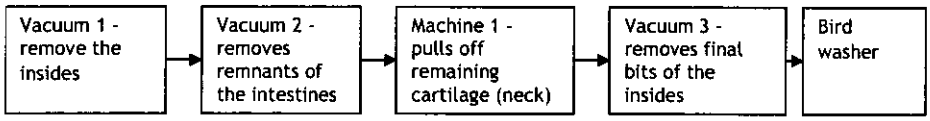


The sections in the plant are Receiving, Chicken Meat Processing, Rendering, Chilling, and Packaging & Storage. In the receiving section, live birds in chicken coops are unloaded from incoming trucks and sent to the unloading area, where workers hook chickens by the legs onto shackles on the overhead Marel conveyor. The empty coops are then washed with potable water and sent back onto outgoing trucks. Hose-pipes are used to wash the floor area continuously. The birds on the conveyor move from the receiving area to the killing station at a prescribed rate where the birds are stunned, and their jugular vein slit by hand. Waste in the killing section is blood and feathers which end up in the wastewater. Blood is allowed to drain from the birds for about 1.5 to 2 minutes and sent to rendering.

The birds moving on the overhead conveyor are sent to a scalding bath where the water temperature is 52^{0}C and live steam is blown into the hot water. The birds spend approximately 2 minutes in the bath and then the feathers are removed in the defeathering machine. The amount of water used is dependent on the amount of feathers that need to be washed out of the machines. Feathers are sent to rendering.

The birds are then sent to the evisceration section where the first operation is the removal of the heads by fixed blades along the overhead conveyor. The feet are then manually cut off. The evisceration consists of exposing the viscera where the lungs, heart, liver, and gizzard are removed in one swift out. Then they pass through machine 2 where any remains are removed by suction. This was followed by a third machine that pulls off the remaining cartilage from the chickens. The last vacuum suction removes the final bits of the insides. After this process the chickens are washed inside and outside. The contents of lungs, heart, liver, and gizzard are also referred to as giblets.

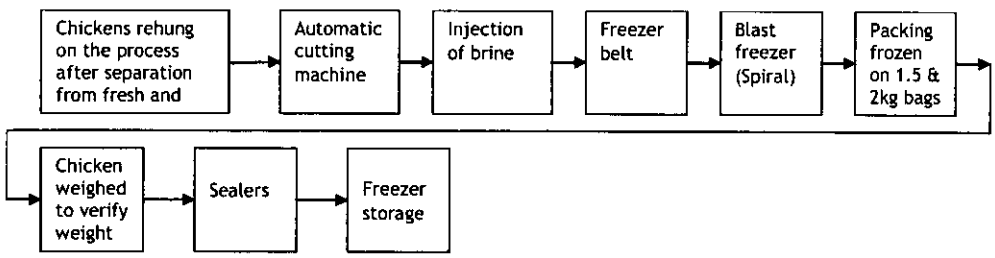
Evisceration process



Wastes from the evisceration room consist of inedible viscera, crops and windpipes, heads, flesh trimmings, grit and sand from the gizzard cleaning, fat, blood, grease, etc. These wastes are generally termed offal and are carried from the evisceration room in the water that flows down the eviscerating trough. The water serves as a transportation system to remove wastes from the plant. There is a final wash after the evisceration section where remaining particles are removed from the bird's carcass. Water is discharged to wastewater. Offal is sent to rendering.

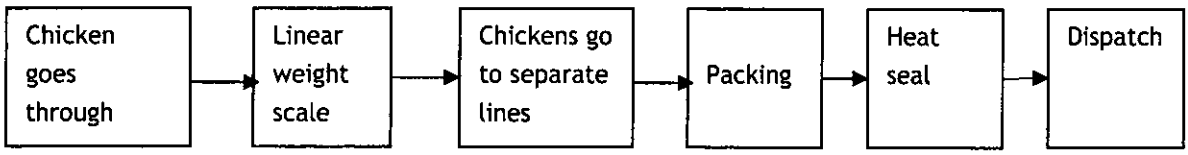
From the final wash, the birds for 'frozen products' are sent to spin chillers containing water and ice in tanks that are stirred mechanically (temperatures of 0 -1^{0}C). Brine is injected into frozen products. Two spin chillers are used and consume 442t/d of water. These have, since the NCPC visit, been replaced with air chillers which will save the plant 442t/d water. During spin chilling, which decreases the bird's temperature, the bird absorbs between 6% to 12% moisture by weight. Water discharged from the spin chillers contain blood, fat, and flesh.

Frozen Department



The products for 'frozen' are then blast freezed to -40^{0}C and sent to packaging into 1.5 kg and 2 kg bags. They are weighed to verify mass and bags are sealed.

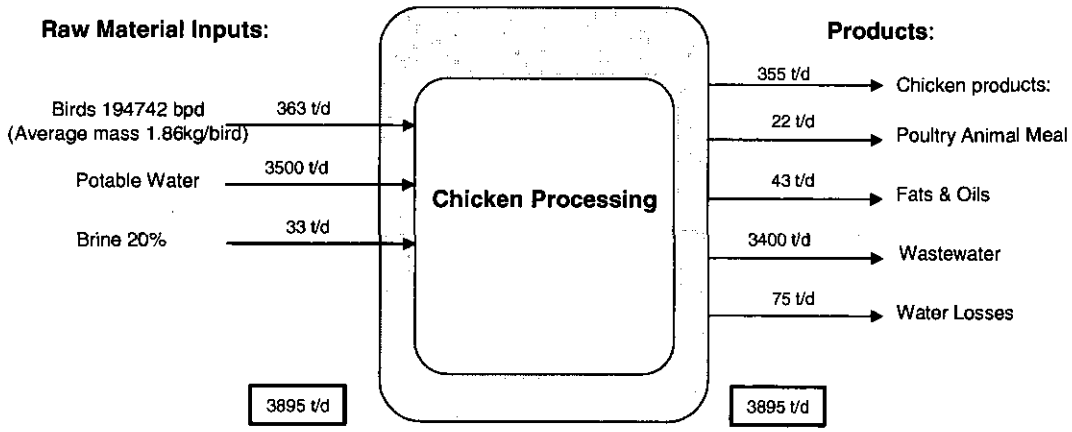
Fresh Department



The birds for 'fresh products' are sent to air chillers at -10^{0}C and then sent to packaging, put into bags, weighed and sealed

All wastewater is sent to the effluent treatment plant where fat is recovered and the partially treated wastewater is discharged to municipal mains.

The mass balance for the plant is illustrated below:



mass rates based on average
June 2006 – August 2006 management figures

Water consumption is 17.97 litres/bird. Water losses are very high at 75 t/d which includes water lost to evaporation, municipal sewers and drains, and condensates.

3.2.3 Rendering

The feed to the rendering plant is all process waste, blood, offals, feathers, and floor waste. The feed enters a series of four cookers heated by 8t/h of 870kPa saturated steam. The product is poultry feed meal which is sold to Meadow Feeds. The feed breakdown is as follows:

Component	%	t/d
blood	4%	14.51
feathers	5%	18.14
water	4%	14.51
lungs	1%	3.63
crop pipes	0.8%	2.90
gizzard cuts	0.8%	2.90
DOA	0.6%	2.18
floor waste	0.3%	1.09
gizzard fat	0.5%	1.81
mala & mala fat	0.3%	1.09
	17.3%	62.75

Almost 17% of a bird's mass is sent to rendering. The product meal from 63t/d of feed is 22t/d. The remaining 40t/d is water lost to evaporation.

4. CP OPTION OF POTABLE WATER & WASTEWATER REDUCTION

4.1 Potable Water Reduction

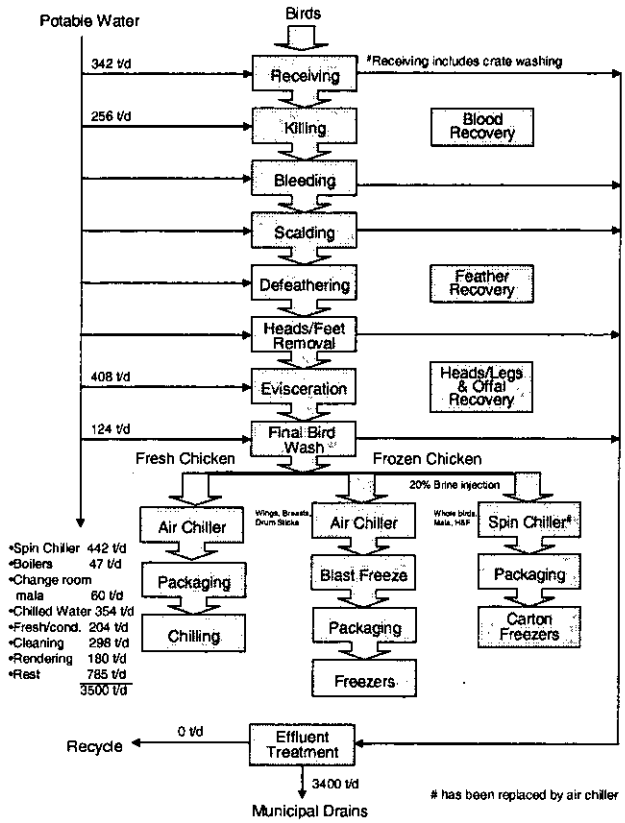
From the time that the CP Quick-Scan was done, there have been significant changes to the plant in terms of water consumption and wastewater discharged. The assessment team recommended the use of nozzles on hosepipes and better water management systems in the Quick-Scan report, which have been implemented by the time the IPA was initiated. There are significant water savings that have accrued.

The CP Option allowed for the investigation of the use of water for cleaning via hosepipes, verification of water meter readings into the plant, calibration, and steam/condensate losses.

4.1.1.1 Distribution of Potable Water

The following diagram illustrates the use of potable water in the processing plant.

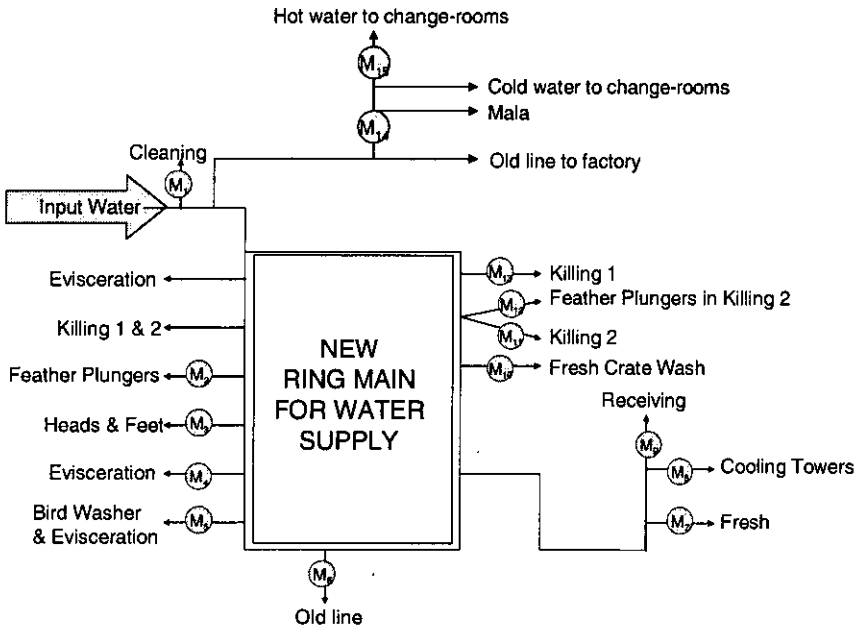
Figure 3: Water Flow Diagram at Early Bird Farm Olifantsfontein Processing



4.1.1.2 Meter Readings

The assessment team identified all the water meters from the municipal mains outside the property to the piping system supplying water to the various sections in processing. This would give an independent check on the water supply volumes and meter readings. There are four municipal meters measuring potable water for the rendering plant, main processing plant, fire water, and administration & factory shop. In table 1 the fire water reading is constant and consumption is zero.

The company has installed a new water ring main in an effort to measure most potable water streams. The water ring main is shown below:



The water meter readings are given in the following table:

Table 1: Water Meter Readings

Water Supply			Meter Readings						Volume of Supply in m3				
No.	Meter	Units	16-Nov-06	17-Nov-06	20-Nov-06	21-Nov-06	22-Nov-06		Day 1	Day 2	Day 3	Day 4	Day Avg.
1	Rendering Plant Main In	m3	003408	003513	003739	003824	003916		000105	000226	000085	000092	127
2	Main Plant Inlet	m3	013519	013821	014193	014467	014737		003020	003720	002740	002700	3045
3	Fire Main Inlet	m3	000004	000004	000004	000004	000004		000000	000000	000000	000000	0
4	Admin & Factory Shop	m3	000425	000426	000435	000436	000436		000001	000009	000001	000000	3
-	Total Water In								003126	003955	002826	002792	3175
5	Pump Inlet	m3	453261	453570	453973	454263	454579		003090	004030	002900	003160	3295
6	Ecowise M1	m3	156253	156432	156781	156961	157168		000179	000349	000180	000207	229
7	M2	m3	010104	010104	010104	010104	010104		000000	000000	000000	000000	0
8	M3	m3	079861	080561	081275	081849	082509		000700	000714	000574	000660	662
9	M4	m3	011982	012176	012375	012486	012604		000194	000199	000111	000118	156
10	M5	m3	435879	435879	435879	435879	435879		000000	000000	000000	000000	0
11	M7	m3	002446	002470	002494	002530	002572		000024	000024	000036	000042	32
12	M8	m3	025937	026037	026184	026280	026386		000100	000147	000096	000106	112
13	M9	m3	022301	022531	022799	023007	023244		000230	000268	000208	000237	236
14	M10	m3	042479	042603	042707	042826	042954		000124	000104	000119	000128	119
15	M11	m3	025635	025875	026098	026379	026682		000240	000223	000281	000303	262
16	M12	m3	045587	046719	046765	046801	046839		001132	000046	000036	000038	313
17	M13	m3	132394	132440	132520	132556	132602		000046	000080	000036	000046	52
18	M14	m3	299895	299895	299895	299895	299895		000000	000000	000000	000000	0
19	M15	m3	027386	027451	027516	027577	027646		000065	000065	000061	000069	65
Killing 1&2 + Evisceration + old line to factory				no meters									809
	Total Supply to Main Plant												3045

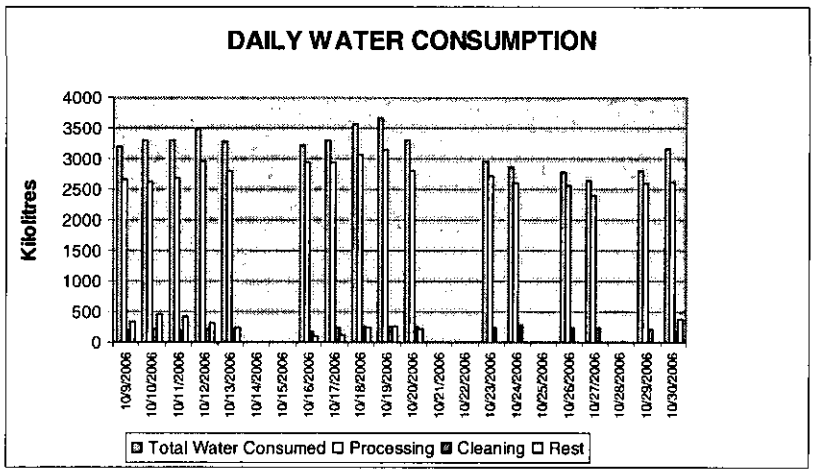
Meters M2, M5, and M14 do not show any consumption readings. Supply to these lines will come from non metered lines. The unmetered water consumption is shown as 809 t/d.

The pump inlet meter is a meter at the entrance to the main plant and it should illustrate identical consumption figures to the municipal meter supplying the main plant. Here, the municipal value was 3045 t/d versus 3219 t/d for the pump inlet. A discrepancy of 250 t/d or 8.2%. As water consumption is critical benchmark, accurate metering is essential.

Recommendations:

- The pump inlet meter should be checked by maintenance, calibrated, and serviced regularly.
- All other meters should be checked by maintenance, calibrated, and serviced regularly.
- Install meters on the rest of the water ring main to obtain clarity on the consumption of the unmetered lines.

The installation of the new water ring main has impacted positively on the water consumption for October 2006. This evident in the following diagram where the new water ring main was installed on 23 October.



Total water consumption has decreased to around 3000 kl/d, whereas, prior to that date, it was above 3000 kl/d. This shows that there is less leakage and losses as the 'rest' have declined. Rest is the water that cannot be accounted for in the process and taken as losses.

4.1.1.3 Use of Hosepipes

Cleaning is carried out by outsourced firm Ecowise. There are 25 hosepipes on site that can be used for cleaning. At any given time, 5 hosepipes are in use. The diameters of the hosepipes are 2.5cm. Initially, during the Quick-Scan phase, the hosepipes were used without nozzles. It was recommended that nozzles be fitted, and currently, all hosepipes are

fitted with nozzles. Cleaning is done inside the plant's processing area as well as outside the plant.
Washing of floors in the receiving area uses a black hosepipe which operates for 45 minutes at a time and stops for 30 minutes. This is done the whole day through. The blue hosepipe is used for the washing of trucks at 45 minutes per truck. There are about 12 trucks washed in a day. In addition, the outside area surrounding the plant is washed once a day for a period of 2 hours. The flow rates from these hosepipes are as follows:

Hose Pipe	Flow rate l/s	kl per day	20% Reduction	Saving kl
Black Hose Pipe (Birds Offloading Section)	0.9090	34.36	27.49	6.87
Blue Hose Pipe (Truck Washing Section)	1.1765	38.12	30.49	7.62
Yard Hose Pipe	1.1765	8.47	6.78	1.70
Total		**80.95**	**64.76**	**16.19**

Reducing the flow rate by 20% from these hosepipes does not appear to make a significant difference to the cleaning process. This can be done by using smaller nozzles or lowering the water pressure at these points. A saving of 16.19 t/day can be expected from this measure.

4.1.2 Condensate Losses

The boiler produces 9 tonnes of steam per hour and only 25% or 2.25 t/h of condensate is returned to the boiler. This translates into a loss of 162 t/day of water. Live steam of 1 t/h is used in the scalding tanks and 8 t/h is used in the rendering plant. Since the rendering plant has a closed steam system, it is expected that 6 t/h or 75% of the 8 t/h should be returned as condensate. Therefore a total of 144 t/day of condensate should be recovered.

Maintenance of steam traps:

Develop and implement a Steam Trap Management Program that incorporates the following activities:

- Personnel training – on entire boiler systems, not just for steam traps
- Identify and inventory steam traps
- Trap inspection and testing procedure – must have a written Standard Operating Procedure (SOP)
- Trap correction processes – included in the SOP
- Trap database and reporting tool. Malfunctioning steam traps waste steam and result in higher boiler fuel consumption. Potential savings for this practice range from five percent to ten percent of boiler fuel use. The simple payback for a steam trap maintenance program is often one year or less.

Reduce system leaks:

Repair leaks in steam piping, condensate return lines and fittings. Leaks cause both higher fuel use and increased make-up water consumption. The energy savings potential, especially in higher pressure systems, increases proportionally with steam loss. Implementing a proactive steam leak management program can reduce a facility's energy usage by one percent.

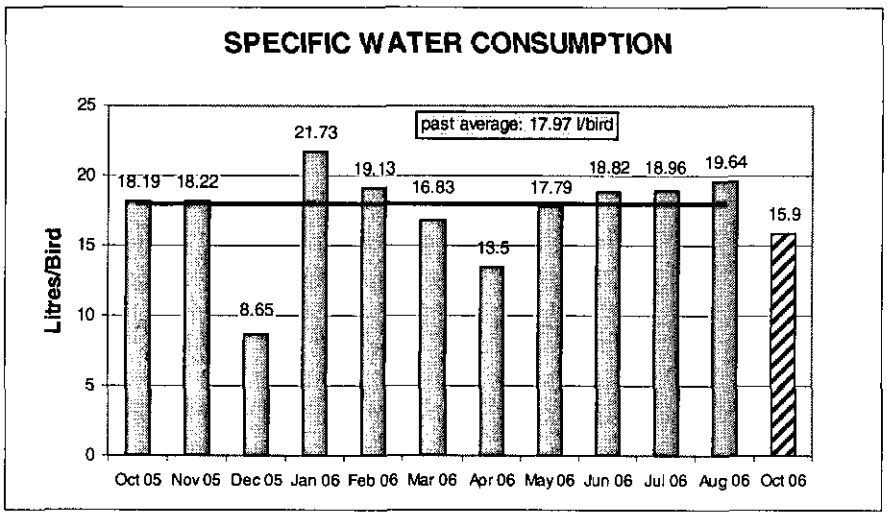
Check and maintain steam coils in cookers. Condensate and steam loss could occur if the coils are leaking. High energy usage as a result of fouling in coils could result.

Recommendations:

- Check all steam traps for leaks
- Check all steam traps for vapour flashes
- Check all valves, flanges, and fitting for leaks
- Check steam coils in cookers.

4.1.3 Other Water Usage

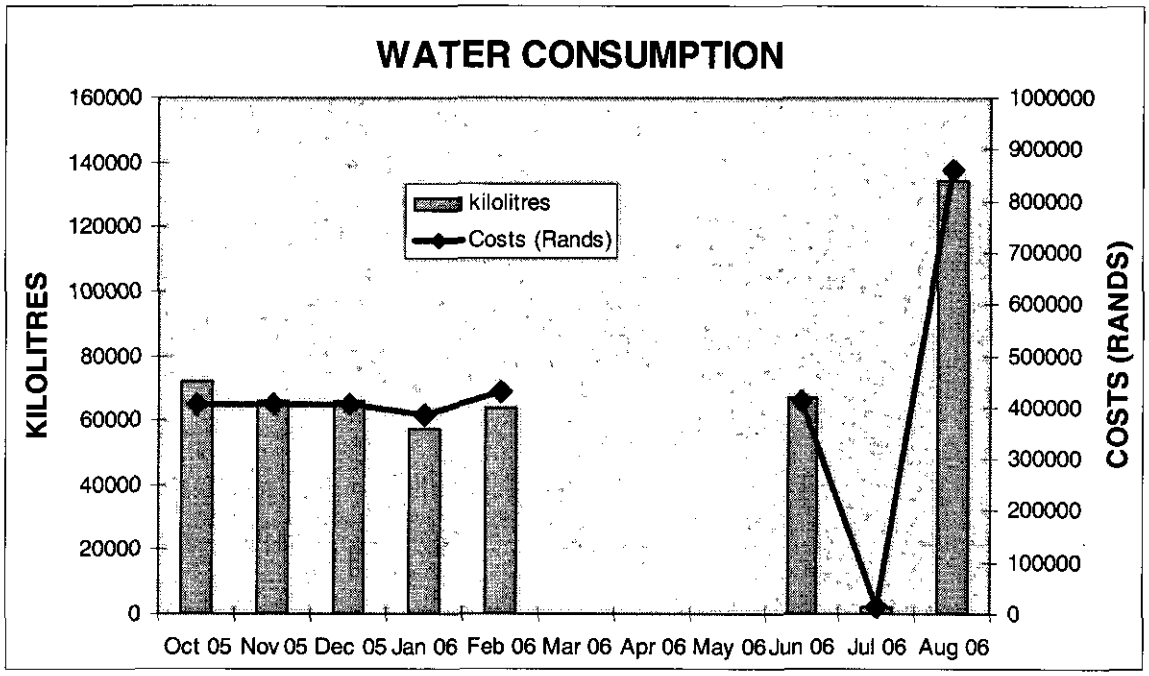
- The washing of product crates (blue crates) on a conveyor belt, where at times some crates are skipped or missing in their position. The sprinklers are operating continuously whether there are crates or not.
- The washing of mala outside uses a fair amount of water which is not metered.
- The use of sprinklers to cool birds appear to run continuously even when no truck is in position.



The high water usage can be ascribed to regulations governing the industry whereby any water coming into contact with meat must be sent to wastewater for treatment and

discharged to mains. It does not allow for the re-use of treated water which would assist in decreasing water consumption.

The improvements from using nozzles for hosepipes, no spin chillers, and the new water ring main is evident in October 2006 with a 15.9 l/bird water consumption.
Water consumption for the factory is illustrated in the following graph. The average consumption was between 66000 and 69000 kilolitres per month with an average charge of R414936 per month.



	Oct 05	Nov 05	Dec 05	Jan 06	Feb 06	Mar 06	Apr 06	May 06	Jun 06	Jul 06	Aug 06
kilolitres	72110	66000	66000	57235	63835	N/A	N/A	N/A	67420	2162	134142
Costs (Rands)	406534	405772	405780	384781	429152	N/A	N/A	N/A	414156	14767	858545

The data for July 06 has been logged on for Aug 06, hence the disparity.

4.2 Wastewater & Effluent Reduction

The CP Option allowed for the investigation of the discharge of wastewater, its quality, and effluent plant modification for optimum performance.

The effluent plant processes some 3400 t/d of wastewater and warrants a base effluent charge of R150000 per month. One third of the effluent is discharged directly to the municipality and accrues a monthly penalty of R270800 resulting in a total monthly charge of R420800. The two thirds remaining effluent is treated and discharged at normal municipal

tariffs. The reasons for this is capacity constraints and the belt press is not operational, therefore the load cannot be handled sufficiently.

Typical effluent quality to the effluent plant is as follows:

	Before Treatment mg/l	To Sewer Line mg/l	Municipality Limit mg/l
COD	5298	2503	< 5000
pH	6.4	6.6	6 - 10
Phosphates	24	28.4	< 50
TKN	-	139.8	No spec.
Ammonia	26.4	37.3	< 200
TSS	1098	1062	< 500

The quality of effluent discharged to the municipality without treatment exhibits high chemical oxygen demand (COD) and total suspended solids (TSS). Implementation of good or new screens will assist to lower the TSS. The upgrading of the present effluent plant is a priority and should be done as soon as possible.

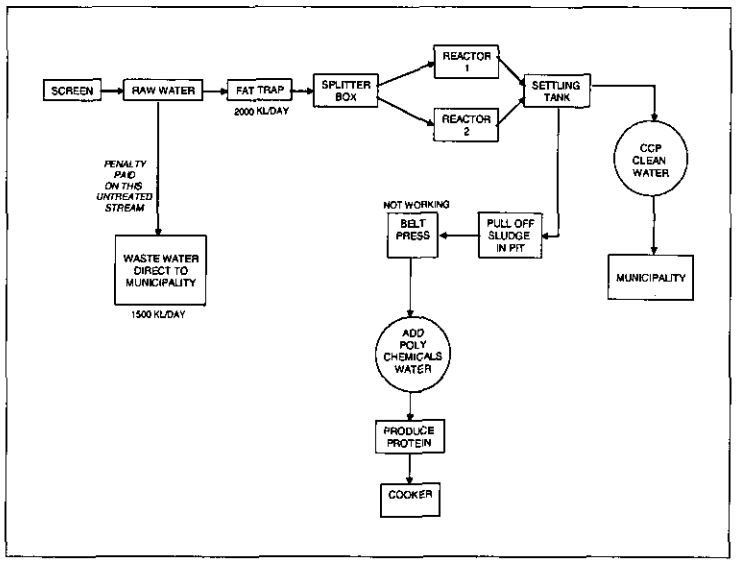
In order to improve the effluent system a redesign and retrofitting of the existing equipment will be required. New screens will have to be installed, an equalisation tank for flocculation and solids loading, and a dissolved air flotation (DAF) unit is also required. The residence time required in the equalisation tank will be 4 hours, and the product COD from the DAF unit is expected between 385 mg/l and 400 mg/l. This is much lower than the municipal requirements of less than 5000 mg/l. This will create a capacity buffer for times when the effluent is under load pressure.

Dissolved Air Flotation (DAF) has become an accepted process for the removal of suspended solids, oil, grease, and other dissolved matter streams from municipal water treatment systems. It is a process which relies on uniting air bubbles coming from solution with suspended particles and subsequently, raising the suspended particles to the surface for removal. The DAF process employs the principle of increased solubility of gas in solution at elevated pressures (Henry's Law). In the flotation process, the stream to be treated is saturated with air at several times atmospheric pressure.

The advantages of Dissolved Air Flotation are as follows:

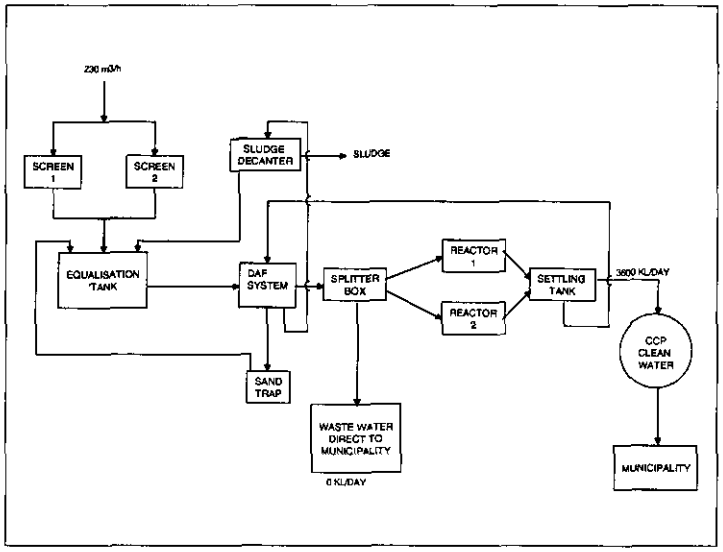
- **Purchase cost is lower** than any other system of comparable waste extraction performance.
- **Installation cost is low**. The unit is typically delivered fully prefabricated. Normal concrete pad installation.
- Space requirements are minimal.
- Capability to treat a wide variety of organic and inorganic solids and dissolved waste streams.
- **Low retention time** from wastewater stream to effluent ejection.
- Superior clarification of most waste streams.
- Easy to clean and maintain.
- Higher density sludge with **low water content**.

The existing effluent plant is as follows:



The existing effluent plant has a treatment capacity of 2800 kl/day, and any excess effluent is sent directly to municipal sewers. This excess wastewater accrues a penalty of R270800 per month.

The new design and proposed plant layout is in the following diagram:



The wastewater flow is based on the maximum flow capacity of 230 m3/h of the DAF Unit. The present wastewater flow is approx. 150 m3/h and sludge flows would be pro rata.

The re-used equipment from the existing plant are:

- Feather Bin
- Augur from belt press to Feed Augur Cookers
- Splitter Box
- Reactors No. 1 & 2
- Settling Tank

The capital cost for this plant is R8 million and with civils is approximately R9 million.

5. BENCHMARKING AGAINST BEST AVAILABLE TECHNIQUES

Water Consumption	Early Bird Farm			Denmark
	Savings kl/day	Savings l/bird	Consumption l/bird	BAT
During Quick-Scan			17.97	
Oct 06	403	2.07	15.9	
hosepipe savings	16	0.1	15.8	
condensate recovery	144	0.7	15.0	
Expected l/bird	**576**	**2.96**	**15.1**	**14.9**

The October 2006 savings results from the use of nozzles on hosepipes, no spin chillers, and the introduction of the new ring water main. With the savings proposed, it is possible

to reach the BAT target of 14.9 l/bird water consumption. The process of continuous improvement together with 20 Keys will always be searching for improved efficiencies and sustainable benefits.

6. ECONOMIC BENEFITS OF CP OPTIONS

6.1 Potable Water Reduction

	Savings/day Rands	Savings/yr Rands
spin chillers	2580	619186
hosepipe savings	102	24576
condensate recovery	922	221184
Total	3604	864946

The annual saving in water cost is R864 946 at R6.40/kl. The ten year saving assuming a 5% annual inflation rate and a 15% discount rate results in an NPV of R5.2 million.

6.2 Wastewater & Effluent Reduction

The penalties that are being paid for high BOD and COD wastes in the effluent will be the revenue used to justify the capital expenditure for the effluent plant. The current penalty is R270800/month. Assuming an inflation rate of 5% per annum and a capital expenditure of R9 million, the NPV, IRR, and payback for cash flows over a ten year period are as follows:

Capital Cost	9.00 million
NPV (15% discount rate)	9.05 million
IRR %	39%
Payback	2.77 yrs

The economics are attractive and the capital expenditure should be part of the next financial year's budget. The alternative is a loss of R3.2 million per year or an NPV of R16.9 million over ten years.

7. IMPLEMENTATION & CONTINUATION

7.1 Action Plan

The action plan identifies the tasks to accomplish the CP Option, identifying the resources needed the responsible person, due dates, and date completed.

Table 2: Action Plan for the implementation of CP Options

	Task	Resources Needed	Responsible Person	Due date	Date Accomplished
1.	Regularly calibrate and maintain all water meters		Maintenance Team	Week 52	
2.	Install water meters on the rest of pipelines on ring main including evisceration and killing 1 & 2		Maintenance Team	Week 52	
3.	Install 20% smaller nozzles on all hosepipes	Supplier	Ecowise	Week 52	
4.	Regular maintenance of all steam traps		Maintenance Team	Week 52	
5.	Monitor and ensure all positions on conveyor are occupied by product crates for washing	Operators	Production Foreman	Week 50	
6.	Monitor and ensure that the sprinklers for cooling birds on trucks are **on** only when trucks are in position	Supplier	Ecowise	Week 50	
7.	Check steam coils in cookers for corrosion or damage		Maintenance Team	Week 52	
8.	Educate operators & floor personnel on hygiene		Production Foreman	Week 50	
9.	Educate operators & floor personnel on the efficient use and cost of water.		Production Foreman	Week 50	
10.	Install new screens and DAF	Supplier	Plant	Week 52	

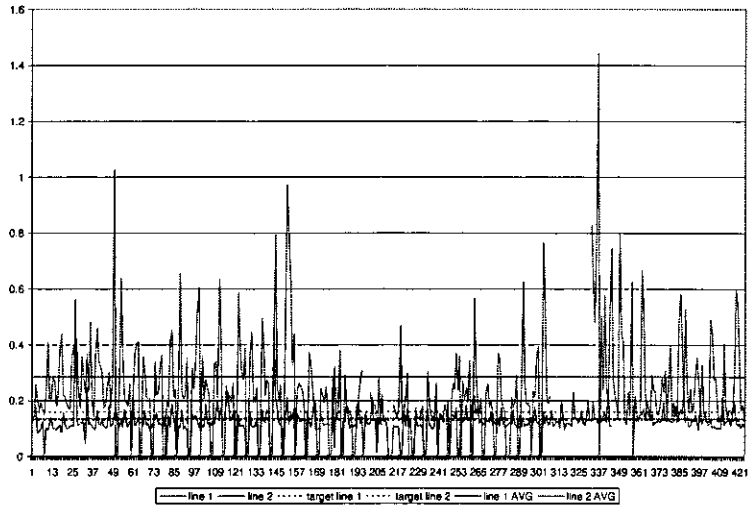
	unit in effluent plant		Manager		
11.	Repair belt press		Maintenance Team	Week50	

7.2 Monitoring

The monitoring of CP Option is to illustrate the improvements as they occur. The before and after water consumption is recorded and the % savings is established. The environmental impact in terms of effluent discharged will also be impacted. This is done by the CP Team.

7.3 Possible Future Water Savings

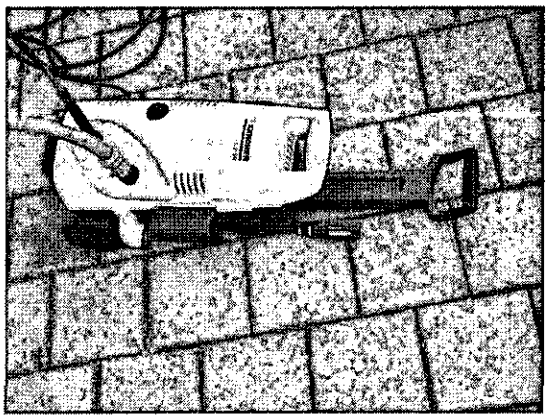
The following is an example of what good water process control can achieve in preventing high water consumption and wastage. The graph below illustrates the example of water consumption in a food processing plant that is monitored continuously during plant operation. The water meters are electronic meters and linked to a control room where continuous monitoring and management is effected.

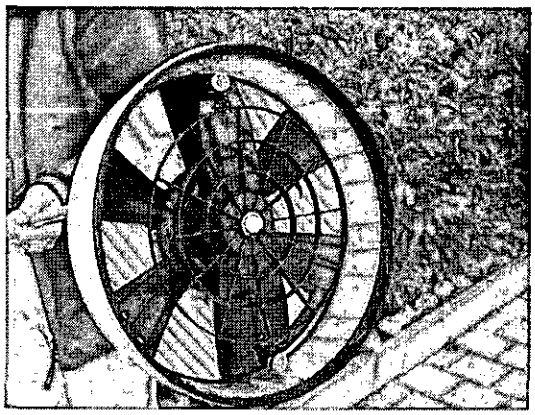


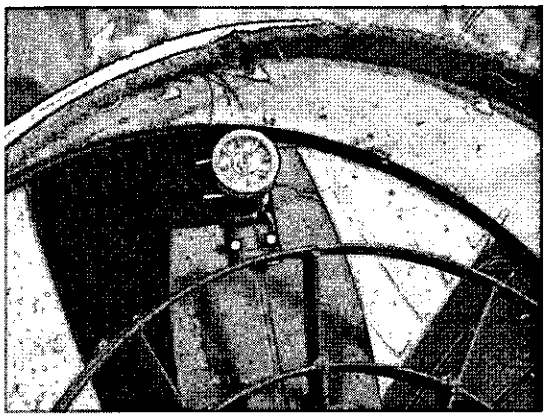
On this particular process, one can notice sharp deviations from the target lines at different times, which is erratic and unpredictable. The use of the electronic water metering system will pinpoint immediately to the operator when there is anomalies in water consumption. Therefore adjustment to the target line is done immediately and prevents long periods of water wastage. This makes the measuring of water consumption more sophisticated. This is recommended for Early Bird Farm to consider in the 20 Keys continuous improvement programme.

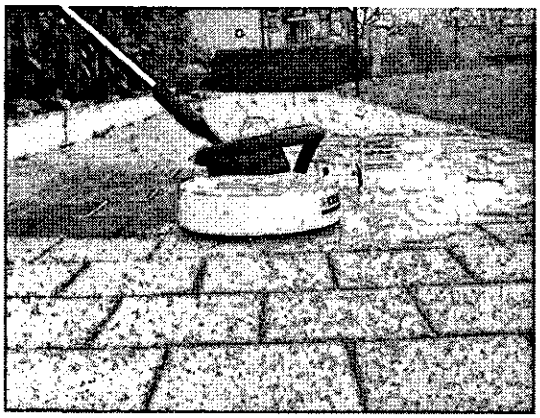
Consideration should also be given to the use of high pressure hoses with a squeegee as shown below. This is used in the plants in Europe as a best available technique to decrease

water consumption. We expect to save 40% of water normally used by the hosepipes. In Early Bird Farm this would translate into a savings of 60 kl/day.









The unit is compact with high pressure valves and splash protection. This practice is recommended and used in Europe where the machine's brushes are sanitised after every wash. This is another recommendation for Early Bird Farm to consider in the 20 Keys continuous improvement programme. The target of 14 l/bird water consumption can thus be achieved.