LEADER IN ELECTRO CHEMICAL ACTIVATION
BIO-SECURITY SOLUTIONS

IQ ECA TECHNOLOGIES POULTRY INDUSTRY BIO-SECURITY DEFINITION

OVERVIEW

This document is a detailed expression of the IQ ECA Technologies Bio-Security offering that has been developed specifically for the Poultry Industry in South Africa. All the data is based on actual trials and years of applications carried world-wide in the poultry vertical.

The key objective of this document is to:

Introduce the poultry industry to a new proven technology that protects the farming environment from external bacterial, viral, fungal and toxic infections. Daily management of biofilm build-up and simpler in-between cycle cleaning goes hand in hand with the installation of the solution.

The document is presented in the following structure:

1. Executive Summary
   The defining business aspects of the complete document specific to the poultry application and value offering.

2. Service Capability Document
   An introduction to the technology of ECA (Electro Chemical Activation), the products Anolyte and Catholyte and the company IQ ECA Technologies.

3. Laboratory testing and results
   The illustration of the testing on bacteria and viruses in laboratories and test facilities from around the world.

4. Case studies and scientific white papers
   The presentation of IQ ECA Technologies findings of the latest trials conducted in Delmas.

5. Value proposition
   A presentation of the potential value to a farmer based on current trials and international application information.

6. Summary and conclusion

EXECUTIVE SUMMARY

The following report provides an analysis and evaluation of the relatively new technology called Electro Chemical Activation in the Poultry industry. It contains the definition of the company and its bio-security offering, the technology, independent testing, trial applications and results, and subsequent financial benefits.

THE COMPANY / TECHNOLOGY

IQ ECA Technologies is a leading provider of Electro Chemical Activation technologies. This is the "Intellectually Protected" combination of electricity, water and salt to produce a completely green, environmentally friendly product. It has the ability to replace existing harmful chemicals, and although not guaranteed, can improve on the farming operational parameters of weight, feed conversion ratios, mortalities and subsequently PEF ratios. Finally, initial trials show gains in the product, potentially replacing antibiotic use in the rearing of broilers.

IQ ECA Technologies has been involved with this technology for over 10 years and has over 50 years of combined resource experience.

THE TRIAL

Background

A trial of the IQ ECA Technologies Bio-secure offering was carried out on a broiler farm in South Africa:

- There were 10 broiler houses with 25 200 birds p/house
- The strain of bird was Ross 308 BS
- The solution was tested for a minimum of 6 cycles
- A challenging broiler site was chosen for the trial
- The broiler site was in serious financial trouble and in the process of closing down
- Performance averages before IQ ECA intervention were:
    - FCR: 1.652
    - Live Weight: 1.695 kg
    - Mortality: 5.83%
    - PEF: 284.58

Results

- Complete removal of harmful pathogens and microbes in water supply
- The complete removal of biofilm build-up in drinking water lines
- Performance averages after IQ ECA intervention were:
    - FCR: 1.605 (85gr improvement per bird)
    - Live Weight: 1.796 kg (101gr improvement per bird)
    - Mortality: 5.17%
    - PEF: 308.40

VALUE PROPOSITION

On a broiler site rearing 252 000 birds (and according to data from the trial) the farmer has potentially the following improved numbers per cycle:

- Additional live weight: 24 136 kg
- Reduced Feed Conversion Ratio: 85g p/bird (20 313 kg)
- Increased PEF: 23.82 points

SERVICE CAPABILITY DEFINITION

INTRODUCTION

This document forms an expression capability for IQ ECA Technologies in the provision of world-class Electro Chemical Activation Technology Solutions. The document clearly defines:

- the company
- the product and technology employed
- the types of services offered
- SLA (Service Level Agreements) and quality control
- the value proposition

COMPANY OVERVIEW

IQ ECA Technologies is a South African established company formed in 2013 by the joining of two leading companies in the Electro Chemical Activation industry, namely ECA Technologies Africa and IQ Green Solutions.

The combined entity, IQ ECA Technologies, is arguably the leader in the provision of green environmentally friendly ECA Solutions. The new company can now boast best-of-breed machinery with the Envirolyte suite of ECA systems and electrolyzed cells, and ground-breaking medical solutions and resources with at least 50 years of combined experience – including the "Father of African ECA Science", Dr Gilbert Hinze. This combination ensures that IQ ECA Technologies is geared to dominate in this market space.

IQ ECA Technologies uses advanced patented Electro Chemical Activation technology to generate ECA Solutions (non-chemical-based cleaning and biosecurity solutions) that are rapid-acting, broad-spectrum and antimicrobial. All ECA Solutions are non-toxic, non-irritant, odourless and environmentally friendly.

ECA products are generated on demand and applied where required to eliminate concerns of procuring, storing and handling of chemical products used to destroy harmful bacteria and viruses.

CONTACTS

All queries regarding the content of this document should be addressed to:

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Managing Director/CFO

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THE OPPORTUNITY

Apart from the global move towards greener products and the major strides made in the quality of the Electro Chemical Activation machines and final products, the market acceptance and belief in the solutions has also increased. This includes industries such as food and drink production, bottling, hotels, and especially farming, which forms a major part of this document's content.

Some defining challenges for the broiler industry are:

- reducing the risk of disease outbreaks
- reducing the effect of sub-clinical infections, resulting in uniformity of growth and therefore improvement of farm efficiencies, increasing revenue through improvement of quality and consistency in produce supply
- world and market resistance against the use of in-feed antibiotics and antibiotic growth promoters in animal rearing
- reduction in the use of harmful cleaning chemicals

One can read the above and consider these as obstacles, but IQ ECA Technologies sees them as opportunities. The broiler bio-security offering from IQ ECA Technologies meets these challenges head-on and provides opportunities for farmers to improve on:

- security of livestock from contraction of outside diseases
- ability to streamline and simplify processes and procedures
- bottom-line savings on chemical and medication spend
- quality and performance consistency

IQ ECA improvements are in line with SADC (South African Development Community) policies seeking to seek to improve the lives of their people by removing the serious obstacle of inadequate access to food, as a healthy, well-fed population will be better equipped to build a better future.

SADC addresses **Agriculture and Food Security** issues within the region by focusing on three key areas relative to the poultry industry:

- Food Security (ensuring sustainable access to safe and adequate food at all times),
- Livestock Production (improving work methods, capacity building and disease control), and
- Agricultural Information (collection of data to monitor progress).

PRODUCTS AND PRODUCT ENHANCEMENTS

PRODUCTS

Electro Chemical Activation is the process of passing a saline (brine) solution and water through a patented electrical process. Two key solutions are produced that have unrivalled properties, namely:

Anolyte is an oxidising solution used as a disinfectant/sterilant which eliminates all types of bacteria, micro-bacteria, viruses, fungi, spores and microbial toxins.

This solution is used wherever pH is important and wherever the need for effective pathogen control is required. These include applications such as disinfection of raw materials, holding tanks, drinking water and effluent water.

Regime	Active FAC (mg/l)	pH	ORP (mV)	Type of generator
Anolyte	~500>700	~5.5>8.5	~700>900	Any ELA unit designed and set for generating Anolyte

Anolyte is a colourless, transparent biocidal liquid. It consists of Hypochlorous acid (HClO) and Hypochlorite ion (OCl^-) which gives it its superior sporicidal and biocidal activity. Active substances conform to all regulatory requirements.

Active substances	Wt/vol %	Symbols
Sodium Chloride	0.26%	NaCl
Hypochlorous acid + Hypochlorite ion	0.05%	HClO + OCl^-
Water	99.69%	H_2O

Catholyte is an alkaline solution that has a pH between 11 and 13 and can be used for flocculation (e.g. of heavy metals), coagulation, washing, extraction. Furthermore, this solution can be used wherever there is a need to increase the pH level of the water to be treated.

Regime	Active FAC (mg/l)	pH	ORP m(V)	Type of generator
Catholyte	0	11-13	~-800>-900	Any ELA unit

THE DEVICE

The IQ ECA Technologies production units are custom built to client specifications. Defining features include:

- The electrodes are specifically designed to endure high electrochemical loading, as are the membranes which separate the solutions.
- The control system is simple and easy to operate. It can be altered to suit differing applications and conditions.
- Stabilisation of working current is introduced to ensure a stable quality of the generated solutions.
- Brine feed ventures and pinch valves are introduced to ensure accurate dosage under all conditions at any time.
- The enclosure is made of non-corrosive materials. Tubes and connectors are made of EPDM/PVDF plastics and are highly resistant against aggressive solutions.
- All input and output connectors are located either at the rear or at one side of the unit to enable easy installation.
- A simple on/off switch with power indicator starts and stops the unit manually.
- Level-switches enable starting and stopping the unit automatically.
- Can include remote access to control and monitor the system.

ACCREDITATION AND TESTING

ECA technologies are now widely accepted solutions throughout Europe, Australia, Asia, and the United States of America.

The following are just a few accreditations that are currently in place worldwide:

- Moyne Institute University of Dublin – Department of Microbiology Trinity College – Dr RJ Russell.
- Roinn Cumarsaide Mars Agnus Acmhainni Nadurtha (Dept Communications, Marine and Natural Resources Ireland) – Council Directive 91/493/EEC.
- AFFSA – France 28th June 2004.
- SABS Approvals for IQ ECA Technologies Solutions – South Africa
- South African Department of Health – Anolyte solutions approved for the treatment of foodstuffs for human consumption.
- South African Department of Agriculture – Anolyte solutions are approved for use in red meat export abattoirs.
- SABS 241:2005: a dilution of the Anolyte solution complies with the requirements for potable/ drinking water standards.
- SABS 1827 & 1828 – Both Anolyte and Catholyte meet the requirements for use in food processing facilities.
- SGS South Africa (Pty) Ltd – Anolyte complies with the requirements of a safe organic disinfectant with no harmful residues.
- Kosher & Halaal approved – alcohol free.
- CE Certified – Conforms with European Union manufacturing standards (2008).
- Department of Microbiology and Plant Pathology, University of Pretoria, South Africa.
- FDA Approval – Center for Food Safety And Applied Nutrition United States of America (August 18th 1997).
- FDA approval for use in food processing facilities.
- USDA Approval – Food Safety Inspection Service (February 18th 1998).
- EPA (Environmental Protection Agency) – USA.
- SABS 1853 – meets the requirements for the use as a detergent-disinfectant (Act 29GNR529/212843/072/769) – Bactericidal, Fungicidal & Virucidal.

METHODOLOGY

IQ ECA Technologies has developed a functional bio-security service based on:

- Pre-implementation Phase
    - GAP Analysis
    - Requirements definition
    - New processes and procedures development
- Implementation Phase
    - Hardware installation or Product Delivered
    - Implement new processes and procedures
    - Training
- Post-implementation
    - Hand-holding
    - Support (Service Level Agreements)

VALUE PROPOSITION

The industries where IQ ECA Technologies will play a significant role are:

- agriculture, fisheries and farming (poultry, pigs and dairy)
- water (drinking and effluent))
- industry (food and beverage production and wastewater)
- healthcare (hospitals and nursing)
- hospitality industry (hotels and restaurants)
- mining and shipping

All the industries mentioned above have a major need for the use of chemicals either in their production process, Cleaning In Place (CIP) and health protection areas. Due to this need, they will all be significantly affected by both Government regulatory bodies and the public at large.

The world is looking at improving its ability to:

(1) present an environmentally friendly image to consumers
(2) Reducing the risk of foodborne diseases caused by bacteria, viruses and associated toxins
(3) improve on the bottom line
(4) manage harmful bacteria, viruses and other pathogens affecting their own delivery of products and services

The consumer demand for safer environments and the reduction of chemicals used in food and production processes promoted the use of IQ ECA Technology solutions.

BUSINESS BENEFITS OF IQ ECA TECHNOLOGIES

- Complete control of all pathogens as well as bio-film build up
- Non-toxic and 100% environmentally friendly
- Transformation of company's "green image" and customer acceptance
- No special HACCP health and safety requirements
- Easy and safe to produce, store, transport and dispose of
- Improve the health and safety of workers
- Savings on purchase of protective wear and health issues
- Can be used across the full production value-chain
- Generated on-site or in concentrated amounts for imminent use, eliminating handling and storage concerns
- Can slot into existing CIP procedures
- Increase in production time and increase in operating efficiency
- Saving on chemical expenditure
- Reduce water costs
- Hypoallergenic
- Potentially reduced use of medication and chemicals

LABORATORY TESTING AND RESULTS

INTRODUCTION

The technology known as Electro Chemical Activation (ECA) has been in existence for over 30 years, but the device that produces the product set (Anolyte and Catholyte) has only recently become market efficient, allowing for ECA technology companies to improve on price and application offerings.

Below is a series of tests and results of Anolyte in various applications and laboratories. The conclusion is simple:

Anolyte kills and manages bacteria, viruses, fungi and biofilm build-up equal to or better than any other existing chemical product on this planet. It has no harmful chemical residual and from the moment the product is manufactured it is not harmful to humans, animals or the environment.

IQ ECA Technologies, together with many ECA companies from around the world, have carried out extensive testing and the following is a representation of the key global results, tests and scientific findings. With regards to the broiler industry, several tests were conducted by Deltamune, a South African biotechnology company that focuses on veterinary and public health solutions mainly for the animal production sectors. These tests are presented first and described below.

The first test shown establishes the efficacy IQ ECA Solution has against *Pseudomonas aeruginosa, Escerichia coli* and *Staphylococcus aureus*. These results clearly show that IQ ECA Solution is 99.99% effective.

The second series of tests carried out by Deltamune comprise the water tests conducted on the boiler trial site over time. Control houses that did not have IQ ECA Solution dosed into the water line are marked ‘C’. Treated houses had IQ ECA Solution dosed into the water lines and are marked ‘T’. This was possible due to the layout of the water lines as half the houses on the farm were supplied by one line and the other half by another line.

Water samples were collected from the drinking nipples within the houses and sent to the lab to be analysed. The control houses were compared with the treated houses and it can be seen the water dosed with IQ ECA Solution (‘T’) continually kept the drinking water sterile, with little to no turbidity as a result of biofilm build-up – unlike the control houses that did not receive IQ ECA Solution.

All the tests showed that IQ ECA Solution reduced the bacterial and fungal counts to near zero and maintained this consistency throughout the trial period, which had been ongoing for over 14 months.

Following the Deltamune tests is a series of tests conducted by Waterlab, firstly to determine the quality of the drinking water and secondly to show that there is a residual content of IQ ECA Solutions (measured as Free Available Chlorine) in the drinking water, which keeps the water sterile and clean. This ultimately assists in the prepyloric disinfection of the chickens.

Several other efficacy tests, including tests conducted by the SABS, as well as many international tests, are available to emphasise the potency IQ ECA Solution has on killing all pathogens it was put up against.

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DELTAMUNE
a unique angle to animal health

Final Test Report

Attention: **Dr. Gilbert Hinze**

Lab number	:	212178
Order Reference	:	IQ Sterilant
Sample Date	:	08/02/2013
Submit Date	:	08/02/2013
Report Date	:	04/03/2013

RE: **IQ Sterilant solution efficacy screening.**

Please find attached the results for the product/s tested as requested.

Comments:

The Product was tested according to **SANS1196:2009** (Ed.3) "Detergent-disinfectants based on organic halogen compounds (other than iodine compounds)".

Only the bactericidal activity of the product was tested in this procedure.

The product was tested against *Pseudomonas aeruginosa* ATCC 15442, *Escerichia coli* ATCC 8739 and *Staphylococcus aureus* ATCC 6538.

Note: In instances where there was no bacterial growth present the value will be indicated as "1" in order to accomodate the number on a logarithmic scale. Where there was too much bacteria to enumerate the value will be indicated as 30000, the maximum detection limit of the test.

Regards,

Mr. Johan Jacobs
Technical Manager
Bacteriology and Feed, Product & Water Monitoring.

Disinfectant efficacy against all bacteria tested:

Product name: IQ Sterilant Solution

Contact time: 30 seconds

Dilution: "As is"

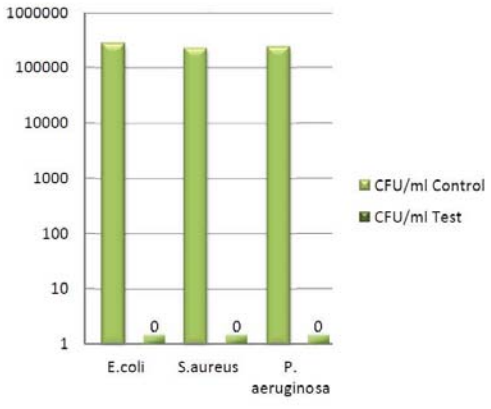
	CFU/ml	
	Control	Test
E.coli	286500	1
S.aureus	237000	1
P.aeruginosa	250500	1

	LOG10 CFU/ml	
	Control	Test
E.coli	5.457124626	0
S.aureus	5.374748346	0
P.aeruginosa	5.39880773	0

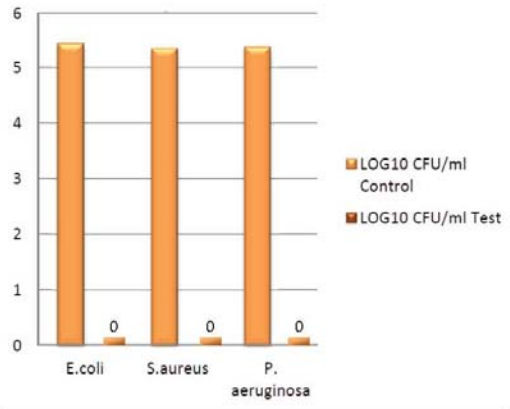
	Microbial effect
E.coli	5.457124626
S.aureus	5.374748346
P.aeruginosa	5.39880773

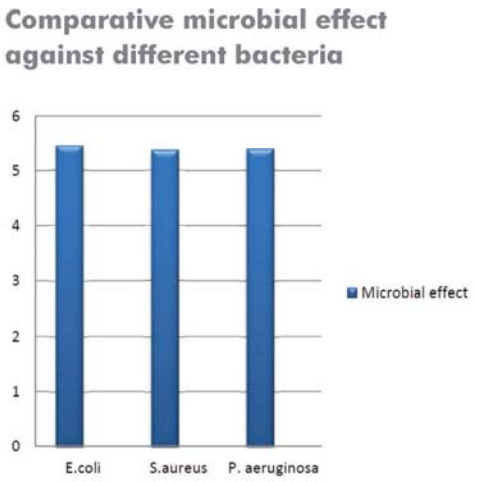
	Efficacy %
E.coli	100.000
S.aureus	
P.aeruginosa	100.000

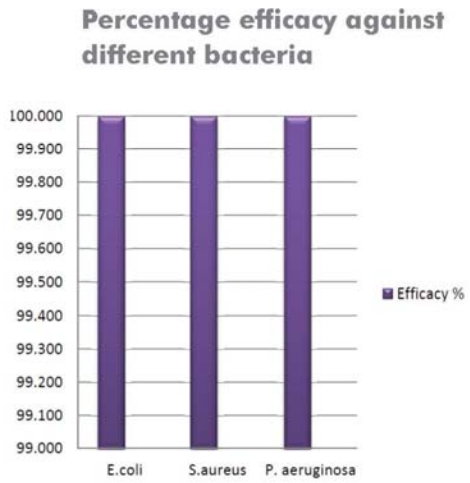
CFU/ml Before and After Treatment



LOG10 CFU/ml Before and After Treatment







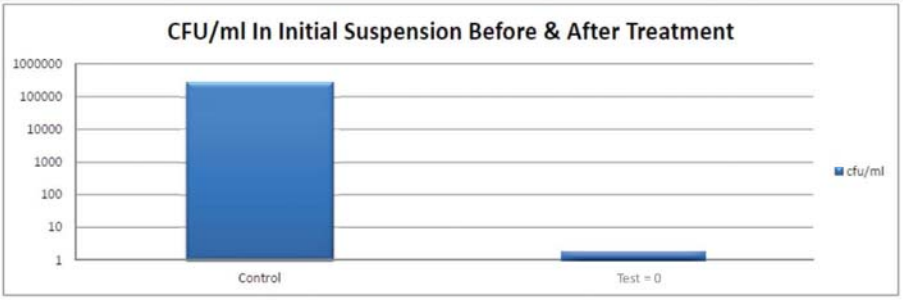
Disinfectant efficacy against Escherichia coli ATCC 10536:

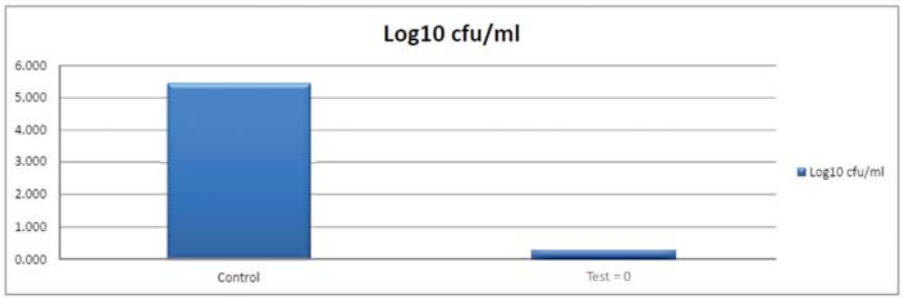
CFU on Plate	
Control	Test
286500	1

LOG CFU/ml		
	Control	Test
Log10 cfu/ml	5.457	0.000

Microbial effect
5.457

Efficacy %
100.000





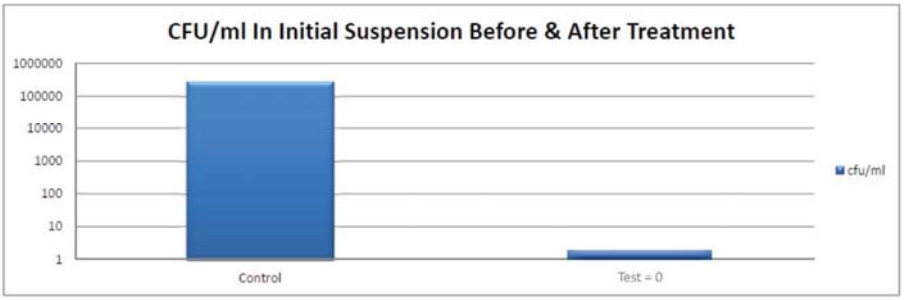
Disinfectant efficacy against Staphylococcus aureus ATCC 6538:

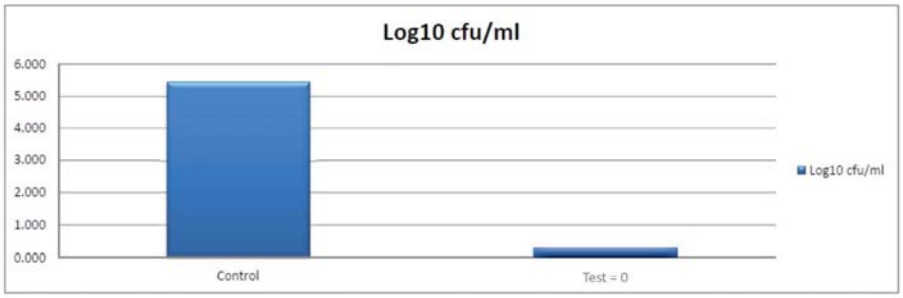
CFU on Plate	
Control	Test
237000	1

LOG CFU/ml		
	Control	Test
Log10 cfu/ml	5.375	0.000

Microbial effect
5.375

Efficacy %
100.000





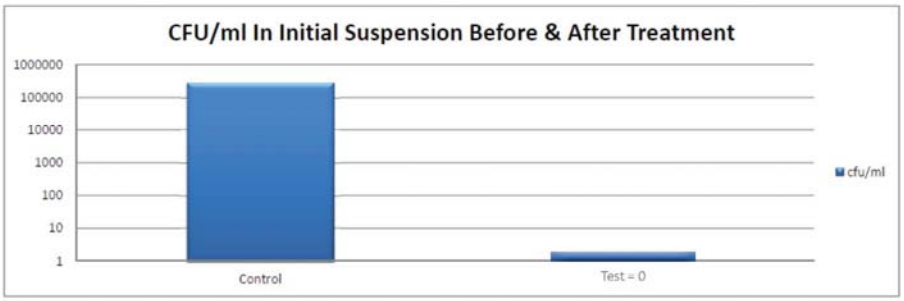
Disinfectant efficacy against Pseudomonas aeruginosa ATCC 15442:

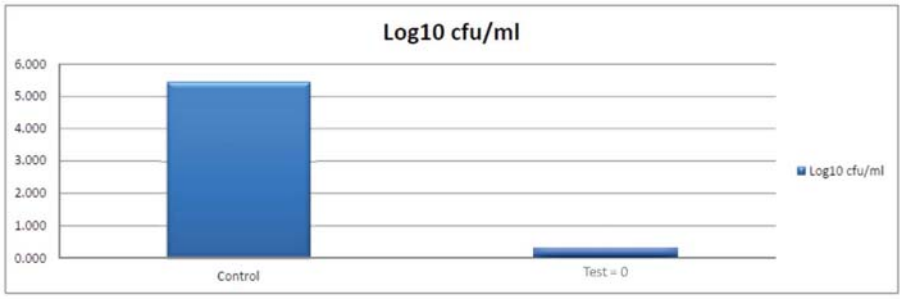
CFU on Plate	
Control	Test
250500	1

LOG CFU/ml		
	Control	Test
Log10 cfu/ml	5.399	0.000

Microbial effect
5.399

Efficacy %
100.000





Based on European Standard Method EN 1276:1997 and also FDA (510K) approved.

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Final Test Report

Attention : RYAL DE WAAL
RE : IQ GREEN SOLUTIONS
Address : SQUIRREL CLOSE 15
STELLENBOSCH
7600

Lab Number : 226345
Order Reference : 216602
Sample Date : 2013/07/16
Submit Date : 2013/07/16
Report Date : 2013/07/19

Accreditation Notices

Deltamune (Pty) Ltd is a SANAS Accredited Veterinary Laboratory, No V0007. Opinions and interpretations expressed herein are outside the scope of SANAS accreditation.

The results reported relate only to the samples tested. The test report shall not be reproduced except in full, without written approval of the Laboratory.

*** - Routine Codes marked with an asterisk are "Not SANAS Accredited" and are not included in the SANAS Schedule of Accreditation for this laboratory.**

*** PRD/25** **Not SANAS Accredited**
PRD/52 **Test method SER-TMD-ME-006 for Microbiological examination of water: Total Count, Escherichia coli, Feacal coliforms and Coliforms.**

Test Results

Product Results

#	Routine Code	Sample Id	Test Procedure	Measurement	cfu / Result	Standard	Completed
1	PRD/52	C2	Coliforms - Water	per 100ml	301	Absent	2013-07-19
2	PRD/52		Total Heterotrophic Count - Water	per ml	10001	<1000	2013-07-19
3	PRD/52		E.coli - Water	per 100ml	22	Absent	2013-07-19
4	* PRD/25		Pseudomonas spp - Water	per ml	10001	Absent	2013-07-19
5	PRD/52	TI	Coliforms - Water	per 100ml	0	Absent	2013-07-19
6	PRD/52		Total Heterotrophic Count - Water	per ml	0	<1000	2013-07-19
7	PRD/52		E.coli - Water	per 100ml	0	Absent	2013-07-19
8	* PRD/25		Pseudomonas spp - Water	per ml	0	Absent	2013-07-19

cfu: Colony Forming Units.

Regards,

Mr. Johan Jacobs
Technical Signatory

WATERLAB

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sanas Testing Laboratory
SANAS Accredited Testing Laboratory No. T0391

CERTIFICATE OF ANALYSES
GENERAL WATER QUALITY PARAMETERS

Date received: 2013 - 07 - 09 | Date completed: 2013 - 07 – 25
Project number: 1000 | Report number: 40812 | Order number: -
Client name: IQ Green Solutions | Contact person: Dr. G. Hinze
Address: PO Box 3266 Matieland 7602 | e-mail: gilbert@iq-greensolutions.com, ryal@iq-greensolutions.com
Telephone: - | Facsimile: 086 609 2023 | Mobile: 082 900 3036

Analyses in mg/ℓ (Unless specified otherwise)	Method Identification	Sample Identification	
		C2	T1
Sample Number		11282	11283
pH – Value at 25°C	WLAB001	6.4	7.0
Redox Potential in mV *	WLAB043	212	787
Turbidity in N.T.U	WLAB005	76	1.5
Free Available Chlorine as Cl_2 *	WLAB036	<0.1	8.0
Sulphate as SO_4	WLAB046	<5	8
Heterotrophic Plate Count / mℓ [s]	---	10 000	0
Pseudomonas aeruginosa / 100 mℓ [s]	---	0	0

* = Not SANAS Accredited
Tests marked "Not SANAS Accredited" in this report are not included in the SANAS Schedule of Accreditation for this Laboratory.

[s] = Analyses performed by a Sub-Contracted Laboratory
Results marked "Subcontracted Test" in this report are not included in the SANAS Schedule of Accreditation for this Laboratory

A. van de Wetering
Technical Signatory

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e-mail: admin@waterlab.co.za

SANAS Accredited Testing Laboratory No. T0391

CERTIFICATE OF ANALYSES
GENERAL WATER QUALITY PARAMETERS

Date received: 2013 - 09 - 11 Date completed: 2013 - 09 – 27

Project number: 1000 Report number: 41902 Order number: -

Client name: IQ Green Solutions Contact person: Dr. G. Hinze

Address: PO Box 3266, Matieland, 7602 e-mail: gilbert@iq-greensolutions.com
e-mail: ryal@iq-greensolutions.com

Telephone: Facsimile: 086 609 2023 Mobile: 082 900 3036

Analyses in mg/ℓ (Unless specified otherwise)	Risk	Method Identification	Sample Identification:		SANS 241:2011 (Standard Limits for Potable Water)
			BR Huis	BR Borehole	
Sample Number			17583	17584	
pH – Value at 25°C	Operational	WLAB001	7.9	7.6	≥ 5 to ≤ 9.7
Electrical Conductivity in mS/m at 25°C	Aesthetic	WLAB002	21.3	21.4	≤ 170
Fluoride as F	Chronic health	WLAB014	0.2	0.2	≤ 1.5
Nitrate as N *	Acute health-1	WLAB046	8.5	9.1	≤ 11
E. Coli / 100 mℓ *	Acute health-1	WLAB021	0	0	Not detected
Heterotrophic Plate Count / 1 mℓ *	Operational	WLAB021	<10	<10	≤ 1 000

* = Not SANAS Accredited
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Technical Signatory

WORLD LEADER IN ELECTRO CHEMICAL ACTIVATION
BIO-SECURITY SOLUTIONS

CASE STUDY

INTRODUCTION

This IQ ECA Technologies Bio-Secure Solutions trial (Case Study) in the Broiler Industry was based on:

- the known powerful decontamination characteristics of the solution
- the premise that the IQ ECA solutions can lower the risk of infectious pathogens
- the potential to remove the application of antibiotics in animal rearing

It was postulated that the dosed IQ ECA Solution would kill bacterial pathogens in the drinking water as well as kill freshly ingested pathogens from pecking litter or ingestion of contaminated food. In other words, the use of IQ ECA Solution in broiler farming creates a bio-secure environment and can assist in the 'pre-pyloric' disinfection of the oral cavity, oesophagus and would assist in preventing the development of infectious diseases.

The case study below represents traditional broiler sites. The commercial trial site has 10 houses with a capacity of ~25 000 birds each. These houses have drop sides that are controlled manually.

BACKGROUND

This site previously experienced extremely low performance parameters and the owners were in the process of closing and selling the site.

IQ ECA Solution was dosed into the drinking water supply to decontaminate the water system. This assisted in providing a cleaner rearing environment which consistently enhanced production performance.

The farm production data and the ECA system data were collected continually during each cycle so that the overall results and performance indicators could be grouped and analysed statistically as well as evaluated critically and discussed.

MATERIAL AND METHODS

IQ ECA Solutions were generated on site using borehole water stored in the reservoir, electricity and salt. The borehole water was analysed in the lab before the system was installed (results available on request).

The IQ ECA Solution produced was stored in a plastic vessel from where it could be dosed into the water lines suppling the chicken houses, using a Dosatron®. Initially the water lines were cleaned by the active ingredients of the IQ ECA Solution. Thereafter dosing took place every day for the full growth period, except on vaccination days.

The strain of bird was the "Ross 308 BS".

During each cycle, several measurements were recorded by farm and IQ ECA staff to ensure the consistency of the application, as well as to measure the performance of the farm from cycle to cycle. These variables are:

1) Water chemistry
    - Oxidation Reduction Potential (ORP or Redox) – measured in mV.
    - pH **–** the pH scale measures how acidic or basic a substance is. The pH scale ranges from 0 to 14. A pH of 7 is neutral.

- Free Available Chlorine (FAC) – measured in ppm (or mg/Litre).
- Turbidity – a measure of the degree to which the water loses its transparency. Turbidity is considered as a good measure of water quality.

2) Production variables
   - Weights – Live weights for each house are recorded weekly by trained staff. Final weights were issued to the contract grower by the supplier.
   - Food Consumption – Measured as a total consumed in each house during the entire cycle and total feed consumed was issued to the contract grower by the supplier.
   - Water consumption – Measured as a total used daily. Water usage of each house is recorded accurately every day after approximately 10 days.
   - Average Daily Gain (ADG).
   - Growth Period – days of growth in the houses from stock to harvest.
   - Mortalities – The mortalities in each house are counted and recorded by trained staff on a daily basis. Final mortality percentages were issued to the contract grower by the supplier.
3) Performance figures
   - Feed Conversion Rate (FCR)
   - Mortality and Survival rates
   - Live weights
   - Performance Efficiency Factor (PEF)
4) Microbial Analysis
   - Water samples were drawn from drinking water nipples in Treated ("T") and Control ("C") houses. Samples were transported to Deltamune accredited Laboratory for microbial tests.

RESULTS

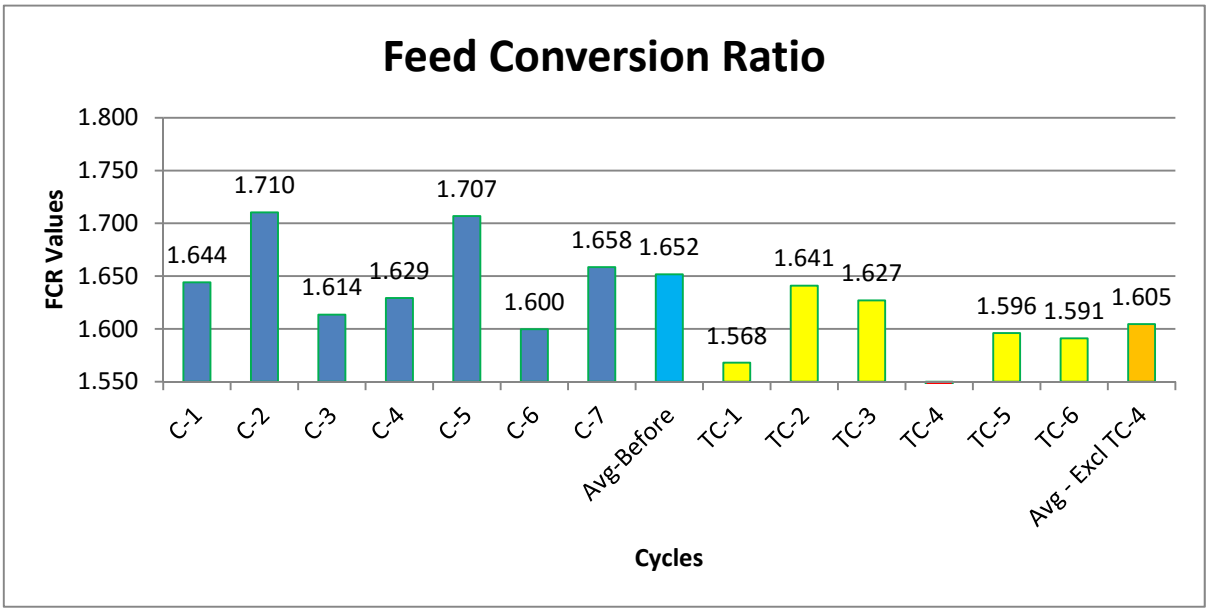
The following is a high-level representation of the results achieved on the farm. The figures of FCR, PEF, mortalities and live weight are represented. Cycle TC-4 has been excluded from the results because of an Ascites (Waterpens) problem on all farms.

ALL figures were converted to a 34day average for better and more realistic comparison.

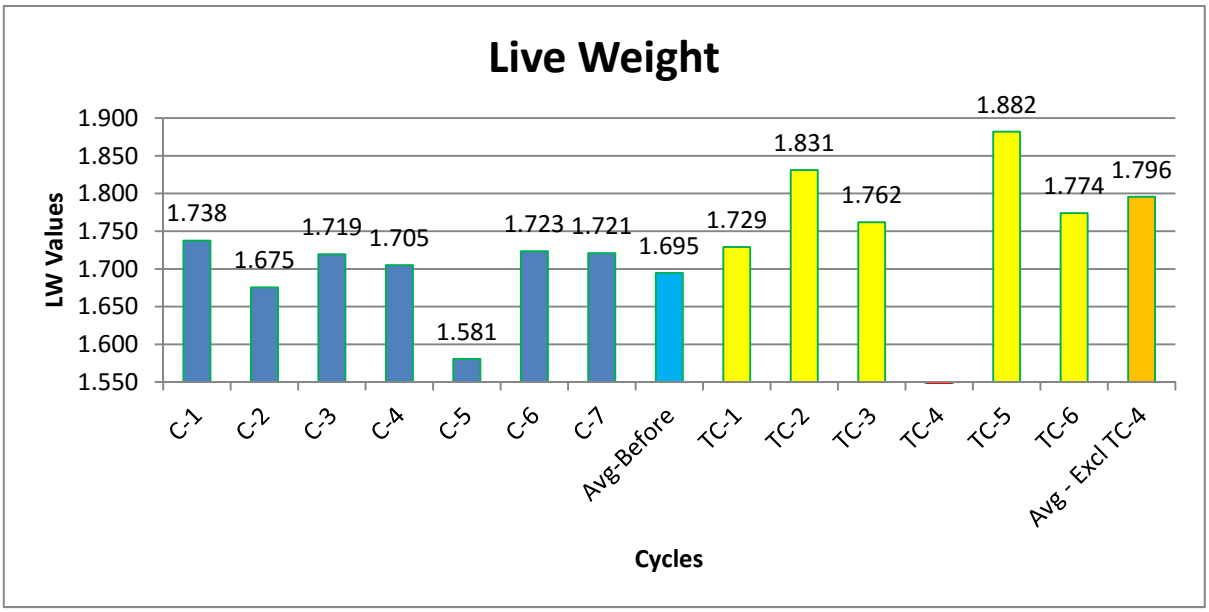
EXPLANATION OF COLOURS:

DARK BLUE – cycles before IQ ECA was introduced.
LIGHT BLUE – average of cycles before IQ ECA was introduced.
YELLOW – cycles where IQ ECA was introduced.
AMBER – average of cycles after IQ ECA was introduced.

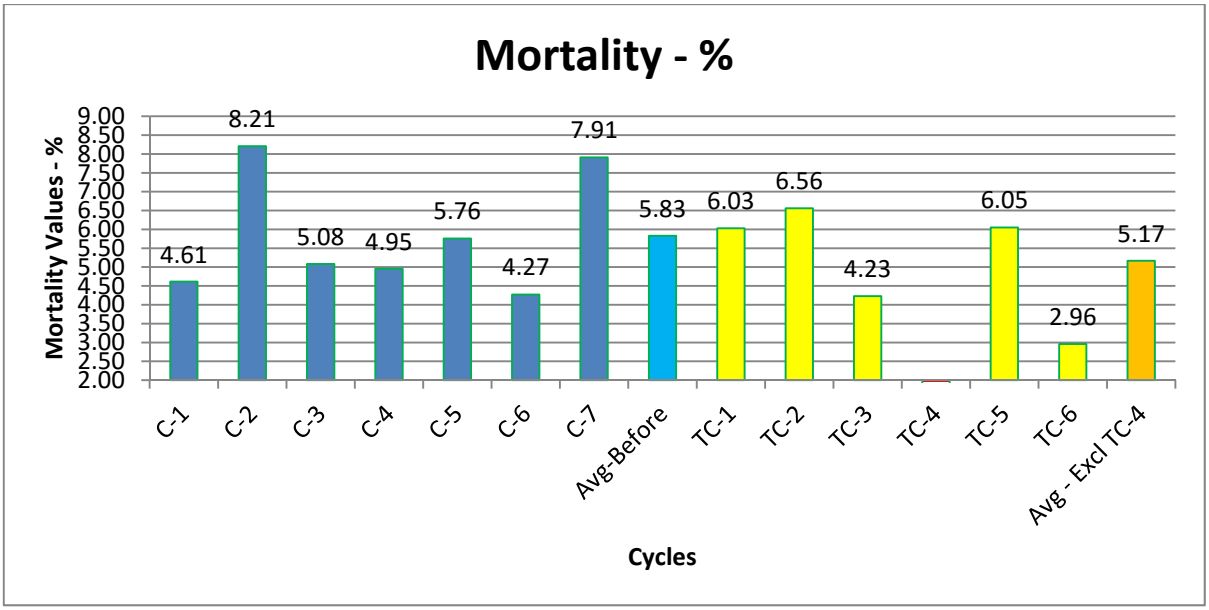
GRAPHS – PRODUCTION VARIABLES



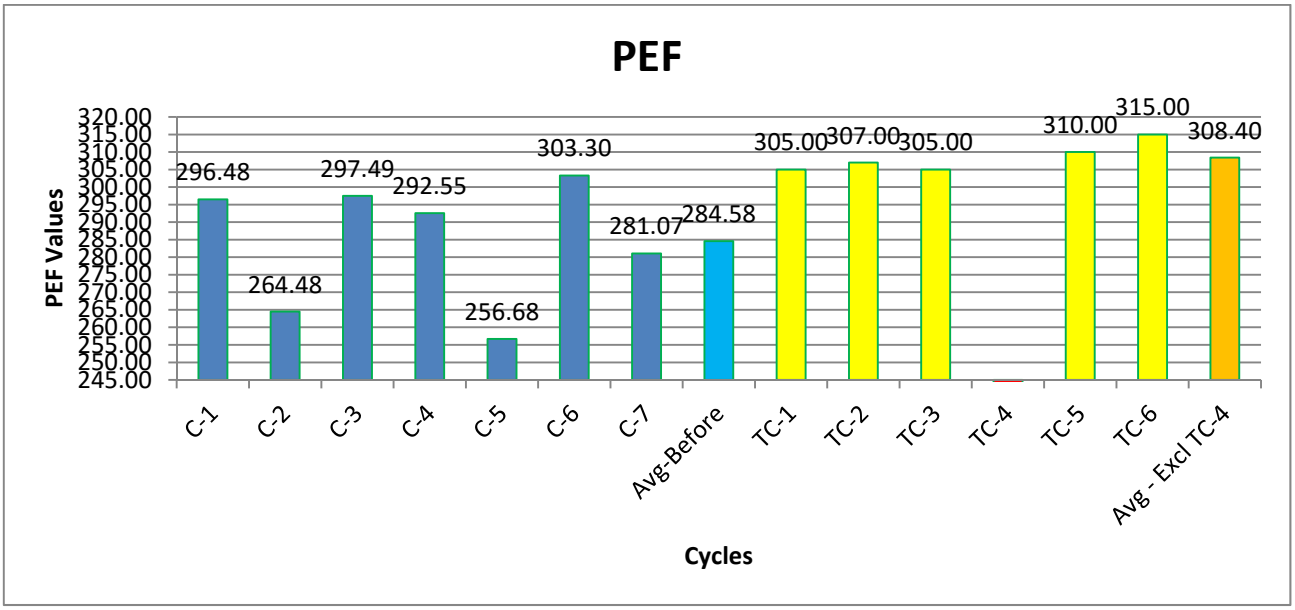
- The average FCR improved from 1.652 before IQ ECA was introduced to 1.605 which amounts to +-85gr p/bird less feed consumed.



- Live weight has increased from an average of 1.695 kg to 1.796 kg.
- A clear improvement trend is visible since the introduction of IQ ECA.



- Mortality improved from 5.83% to 5.17%



- The PEF increased from an average of 284.58 to 308.40 after IQ ECA was introduced.
- PEF of above 300 was consistently achieved except for TC-4 when Ascites (Waterpens) was diagnosed.

OTHER POTENTIAL BENEFITS AND RESULTS

- Removal of biofilm from water drinking lines and wet walls
    - In all the broilers houses where IQ ECA Solution was used, no slime or biofilm was present, no blockages were ever recorded, bacterial counts were repeatedly zero, and all inline filters were consistently clean.

Example of Biofilm in water lines

- Dust and ammonia reduction
    - Up to 60% reduction of the ammonia content in the air was observed when compared to houses that were not fogged with IQ ECA Solution.
    - We experienced a settling of dust due to the electrostatic nature of the misting solution.

Maintenance of respiratory cilia when Ammonia levels are reduced

- External infection control and general bio-security
    - The residual IQ ECA Solution levels in the drinking water have the potential to eliminate exogenous pathogens ingested via litter pecking or contaminated food.
    - By killing pathogens before they reach the gut of the animals ultimately assists in preventing infection.

DISCUSSION POINTS

GENERAL

- The oxidising chemistry of IQ ECA Solution plays a critical role in making it a potent disinfectant effective against bacteria, viruses, fungi, spores and protozoans. **Microbes do not build up any tolerance to it.**
- **Nontoxic and environmentally friendly**, safe to handle and when exposed to the environment it reverts back to its composition of salt & water.
- Importantly, IQ ECA Solution is neutralised when it comes in contact with organic matter, therefore it does not kill the normal gut flora in the chickens, which are necessary for growth.
- Produced on demand and strength can be controlled.
- Diverse application options – water dosing, spraying, fogging, immersion, infusion, etc.
- In waterlines where IQ ECA Solution was **not used**, the bacterial counts were repeatedly **too numerous to count.**
- Laboratory analyses always showed that the waterlines dosed with IQ ECA Solution **had zero bacterial counts.**
- With high ammoniac levels the chickens can develop diarrhoea, causing the chickens to walk in wet litter which burns their feet.
- At sites where IQ ECA Solution was used, wet litter was never recorded or observed.
- The solutions is also capable to replace in between cycle cleaning chemicals.

SERIOUS CONSIDERATION – BIOSECURITY VS. ANTIBIOTICS

All over the world a mosaic of antibiotics as well as Antibiotic Growth Promoters (AGPs) have been included in animal rearing systems in an effort to reduce and prevent mortalities caused by specific pathogens.

It is estimated that globally 80% of all antibiotics are used in animal production, 15% in humans and only 5% in hospitals. Moreover, the elimination of antibiotics used routinely or lately on prescription by Veterinarians still does not solve the problems associated with pathogenic infections in the modern Broiler Industry. In fact the risks, dangers and losses are higher than before. The highly contaminated rearing environments result in higher carcase surface contamination, increased toxin production and compromised food safety.

From a medical and moral stand point, **antibiotic resistance** and the possible transmission to human bacteria through animal-borne pathogens has led to increased public concern and interest regarding the administration of antimicrobials to animals.

In this regard, the concern remains that drug resistant bacteria infecting poultry could pass the genes on to bacteria that cause human illness. **Current antibiotics in use do not afford protection against resistant pathogens**. All things considered, antibiotics are also very expensive by ways of financial and health costs and the savings from the use of IQ ECA Solution can be enormous for the industry.

Growth promoters (AGP's) currently used in RSA have already been banned in the EU and will shortly be banned in the USA. Eg oliquindox. It has become imperative that an alternative method for pathogen reduction and prevention of infectious diseases be developed. The alternative is water that has been electrochemically activated by IQ ECA Technologies.

With this in mind, there is a tremendous amount of encouraging initial results to support the removal of antibiotics in the broiler industry. IQ ECA Technologies provides an alternative to this contentious issue. Along with the strengthened support from the industry as a whole, the long term financial and health benefits are astronomical.

VALUE PROPOSITION

INTRODUCTION

In this Value Proposition section of the document, IQ ECA Technologies has used the local case study in South Africa presented earlier. After rigorous research in the market place where we have analysed the current costs associated with operating a broiler facility, we have managed to commercially quantify the bottom-line financial benefits a broiler farmer may benefit from after the introduction of the IQ ECA Solution.

This analysis has been presented below, where IQ ECA believe we can add financial value by introducing our solution to your business. Although we understand that the remuneration structures differ from supplier to supplier, the overall improvement in certain key parameters are indicative of the value that can be added.

DIRECT IMPLICATION ON PRODUCTION PARAMETERS BASED ON ACTUAL PERFORMANCES OF THE TRIAL

VALUE	Average before ECA	Average after ECA	Value change	% Change
1- FCR	1.652	1.605	85gr less feed/bird	2.86%
2- LW	1.695	1.796	101gr/bird	5.96%%
3 - PEF	284.58	308.40	23.82 points	8.37%
4 - MOR	5.83%	5.17%	0.66 basis points	11.37%

Taking the size of the TRIAL SITE into account, the following calculations are indicative of what can be achieved by introducing IQ ECA solution to a broiler site:

- Number of houses = 10
- Number of birds per house = 25 200
- Birds per site = 252 000 (slaughtered, subtract 5,17%) = 238 972 birds

Therefore, using excluding cycle TC-4's figures:

- Additional Live Weight (101gr p/bird) = 24 136 kg
- Reduced feed consumption (85gr p/bird) = 20 313 kg
- Increased PEF of 23.82 points (increased bonus revenue which was applicable on the trial site)

Furthermore:

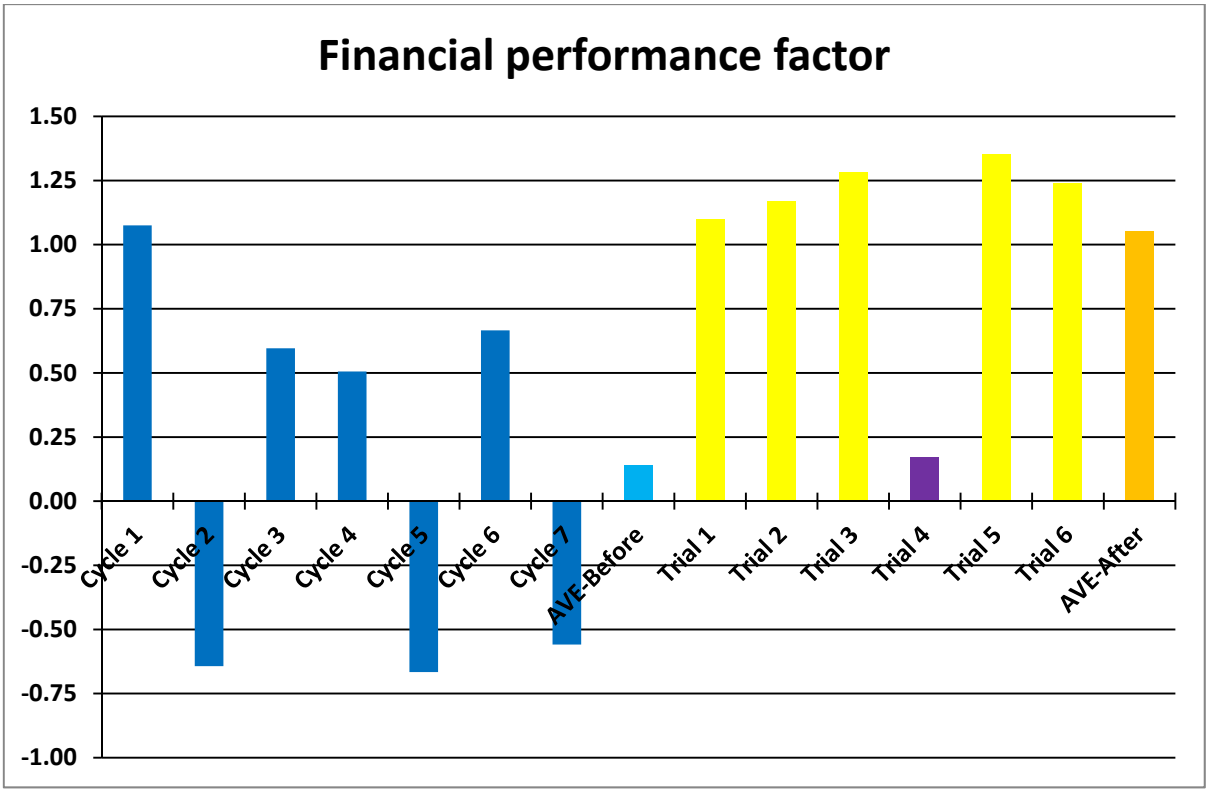
- this particular TRIAL SITE has improved on its overall ranking from above 50th to constantly one of the top ten performers in the group.
- the cost of antibiotic food medication has not been considered. It is important to note that this is a reasonable cost to the farmer and/or
- This is the same for growth promoters and coccidiostats.

This improved performance obviously converts into higher bonus payments due to higher PEF successes. The graph below populated from actual performance figures, indicates the constant bonuses paid out after ECA was introduced from cycles 243 onwards.

The **YELLOW** **clearly** shows the improved bonus payments after IQ ECA implementation. It is important to note that even though bonus payments were frequent before IQ ECA, they were not consistent.

Cycle TC-4 (purple bar) was lower because of “waterpens”.

Apart from increased revenue, it is the consistency in results that play a major part in the financial management of a farm, where targets and budgeting for costs and revenue is a difficult exercise.



IQ ECA Technologies Cost Considerations

Based on our preliminary calculations and the size of the machines needed for an average site of 252 000 birds/cycle, the cost of the IQ ECA solution will be less than 7c/kg

CONCLUSION

SUMMARY

Unless we develop and implement technologies capable of preventing disease while maintaining current broiler production parameters, without employing feed antibiotics or harmful chemicals, food security as we know it may be severely compromised.

We believe that ECA generated Anolyte can assist significantly in that objective. ECA solutions are being employed on an increasing scale globally in water treatment, food processing animal rearing systems, horticulture as well as in the medical, dental and veterinary fields. This is mainly due to the efficacy against bacteria, viruses and fungi as well as in instances where toxic or harmful compounds are not allowed.

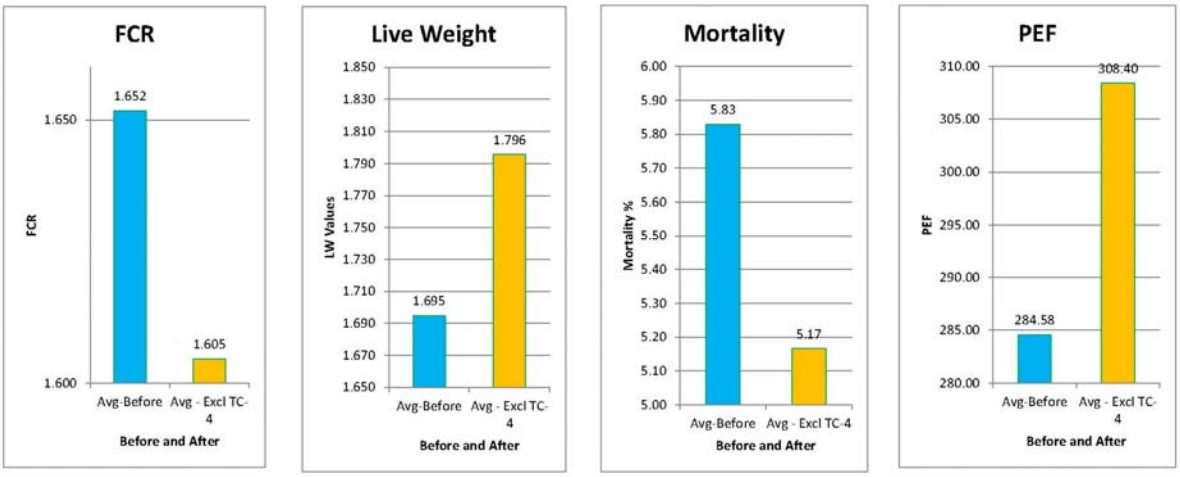
IQ ECA Technologies have gone a long way in proving that ECA generated solutions are a viable and exciting alternative in rearing broilers on a commercial scale. We have exposed more than 1.5 million broilers over six production cycles on an existing commercial site to Anolyte dosed into the drinking water lines to reduce the risk of waterborne infections. By decontaminating the water, removing slime (biofilm) effectively and killing pathogens in the upper gastro-intestinal tract, we are preventing acute infectious diseases and reducing the erosive effect of certain erosive infections.

We have demonstrated that the technology may be applied in the presence of in feed antibiotics and when no antibiotics were included. The main benefits recorded thus far may be described as follows:

1. Improving biosecurity by eliminating all endogenous and exogenous acquired waterborne pathogens, in a slime or biofilm free environment. The need for cleaning in line filters, blocked drinking nipples and fogging nozzles is thereby completely eliminated.

2. Production parameters were consistently improved on average in all the trials:
   - 2.1 Improved Feed Conversion and [85gr less feed consumed/bird, 1.652 to 1.605]
   - 2.2 Live mass [101gr improvement, 1.695 kg to 1.796 kg]
   - 2.3 Mortality rate reduction [5.83% to 5.17%]
   - 2.4 Improved PEF [23.84 points, 284.58 to 308.40]

(The ranking improved steadily over 6 cycles from 52/58 to 26/58 to 10/58 to 9/58 and now to 8/58. This was achieved despite the fact that the site was situated directly next to a busy railway line and on a coal mine where underground blasting occurred regularly.)



3. Improved additional revenue per cycle without consideration of the cost of antibiotic medication and savings on cleaning chemicals.
4. Cleaner air space in respect of lowered ammonia levels, settling of dust particles where fogging was applied.
5. Flock uniformity was noticeable.

While we admit that a tremendous amount of work is still outstanding in broiler production alone, we believe that the tests conducted as described in this document address the challenges posed earlier. We now have the confidence to make meaningful recommendations in respect of dosing levels and have all the necessary measuring instruments to ensure effective administration. Remember there are no references or meaningful publications on the subject. IQ ECA Technologies therefore intends to commission commercial installations in the local broiler industry and monitor them diligently in respect of performance parameters. We will rely on the inputs and co-operation of poultry veterinarians in this respect.

An important outstanding project is the application of the solutions on breeder farms and in incubation. Again, we believe that we will be able to replace toxic chemicals from hatchers and improve the overall hygiene of these installations. We expect the net result to be a healthier hatchling with an intact respiratory system, augmenting its natural defence system significantly.