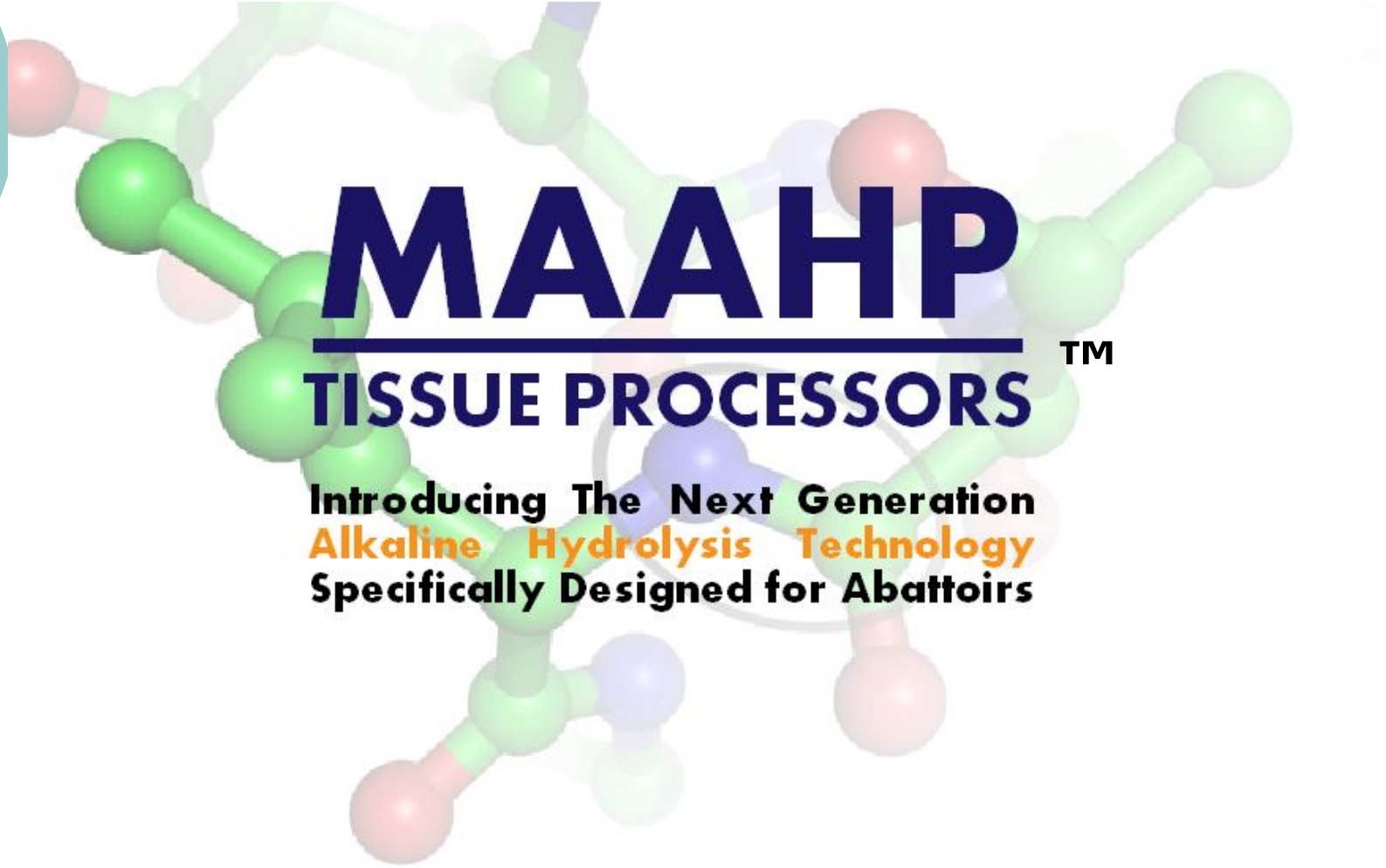
WASTE RESOLUTION TECHNOLGIES



WHAT IS A TISSUE PROCESSOR?

A tissue processor is a highly specialized piece of equipment that breaks down PROTEIN BASED materials through a catalyzed thermo-chemical process, thereby effecting irreversible hydrolysis of the protein back into its original building blocks i.e. small peptides, amino acids sugars and soaps.

FEEDSTOCK FOR A TISSUE PROCESSOR







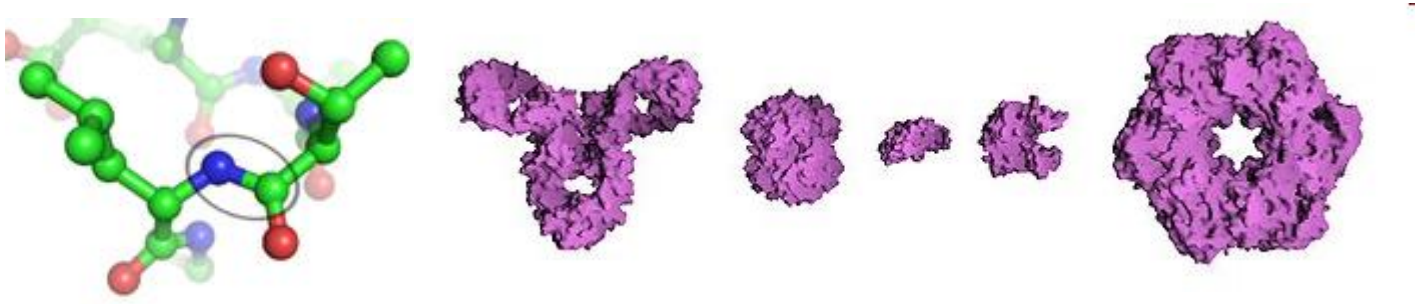
FAT | OFFAL | HEADS | FEATHERS | INTESTINES | ORGANS

ANYTHING THAT ONCE WAS - OR BELONGED TO - AN ANIMAL CAN BE PROCESSED IN A WRT MAAHP TISSUE PROCESSOR

MAAHP TISSUE PROCESSORS (cont.)

The MAAHP systems use heat, water and a base catalyst as the three main components to rapidly dissolve tissue.

What begins as tissue ends up as a liquid mixture of amino acids, small peptides, sugars, nutrients, and soap, along with the mineral ash of the bones and teeth (calcium phosphate).

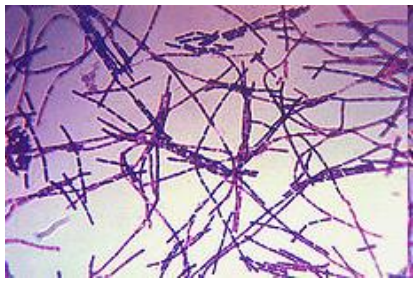


MAAHP Process Requirements

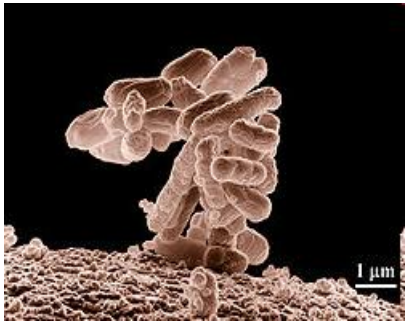
WHAT ABOUT PATHOGENS ?

The protein coats of viruses are destroyed and the peptide bonds of protein based infectious organisms are broken down, thereby destroying the infectious organisms.

The resulting liquids and solids are pathogen free due to process time and temperature, alkalinity, and the complete homogenization of the protein based materials.



BIO-SECURITY IS A GIVEN WITH THIS PROCESS



A CAUTIONARY NOTE ABOUT PRIONS

MAAHP tissue processors have been designed to deal with material and the associated pathogens encountered during the normal day-to-day operation of an abattoir, and have not been field tested using prion infected material.

Whilst there is compelling scientific evidence to suggest that low pressure alkaline hydrolysis is effective in prion destruction (refer Dr. David Taylor et al), we recommend HIGH PRESSURE AH systems for material that is suspected to contain prions.

An Expert's Opinion – Dr David Taylor

Although earlier work with hot alkali and prions involved hyerbaric vessels, my own later work with the thermostable 301V strain of BSE agent showed that boiling for one minute in alkali at atmospheric pressure completely inactivated this high-titre agent. These data were first presented in 1999 to a meeting of the Association of Veterinary Teachers and Research Workers in Scarborough (UK). Since then, I have presented the same data at around ten international meetings and in a number of publications. To my knowledge, there are no contradictory data, and I have never been challenged publicly or privately regarding the accuracy or validity of my data.

NON-PROTEIN BASED MATERIALS

A MAAHP tissue processor is a very effective means of dealing with proteinacious material, but is not designed to fully digest material derived from plants and is wholly ineffective against inorganic substances such as plastics, synthetic polymers and metals.

Indigestible materials still benefit from the thermo-chemical treatment in terms of providing pathogen control, and there is no need to separate these materials if they are present in the tissue that is being treated.

A VISUAL PROCESS OVERVIEW

1. Load Tissue
2. Add Catalyst
3. Add Water
4. Hydrolyze the Tissue
5. Discharge the Tissue Processor
6. Recover Tallow / Fats
7. Recover or Recycle the Hydrolyzed Protein

LOAD TISSUE

ADD CATALYST

ADD WATER

CLOSE LIDS AND CLEAN AREA

START PROCESSOR

THE HYDROLYIS PROCESS

12 – 24 HOURS

NO HUMAN INPUT REQUIRED

DISCHARGING THE TISSUE PROCESSOR

STEP 1 - DISCHARGE HPL

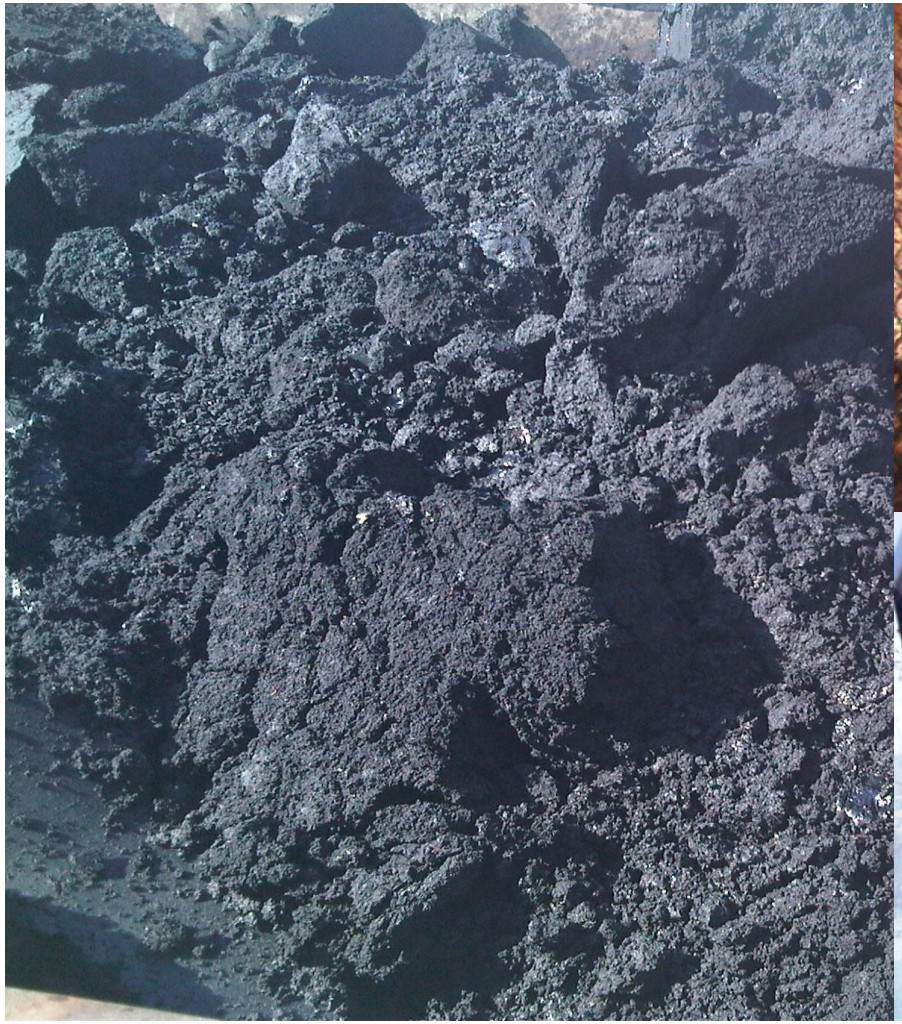
STEP 2 – RECOVER FATS

STEP 2 – RECOVER FATS cont…

RECOVERED FATS – PREMIUM PRODUCT
R 4000 – R5000 PER TON

WHAT IS LEFT AFTERWARDS

OPTION 2 - DRIED HYDROLYZED BLOOD
R 3500 / ton (Ex Krugersdorp)



LABORATORY RESULTS

Microbiological Tests

Test/s required: Total plate count

Dilution Series	Sample 1	Sample 2	
Undiluted	0	0	
1.00E+03	0	0	
1.00E+06	0	0	
1.00E+09	0	0	
1.00E+12	0	0	
Average	**0**	**0**	

Biological Activity		Target Values (Fertilizer Industry: QC Standard)
Total Viable Macro-Organisms (Organisms per litre)	0	Zero
Total Viable Micro-Organisms (Colonies per millilitre)	0	Zero
Moulds & Yeasts (Positive Negative Test)	Negative	Must be negative

BDL = Below Detection Limit

(mg/ℓ) = milligrams per litre = parts per million

(µg/ℓ) = Micrograms per litre = Parts Per Billion

Please Note: This report only relates to the actual sample supplied and analysed. No responsibility can be accepted, related to the use of these results and recommendations provided.

Comments

No colony forming microbes were detected on total plate count agar. No bacterial or fungal contaminants detected in the samples.

With regards to bacteria and fungal species the samples can be regarded as biologically safe.

LABORATORY RESULTS (cont.)

1. **GENERAL**: Deon Viljoen – Alkaline Hydrolysed Material - Sampled 11 June 2010

CONSTITUENT		Alkaline Hydrolysed Material
pH	pH-units	11.8
Nitrogen – Total (as N)	%	14.38
Bio-available Nitrogen	%	14.22
Phosphorous – Total (as P)	%	3.29
Bio-available Phosphorous	%	3.29
Bio-available Potassium (K)	%	24.1
Bio-available Calcium (as Ca)	%	1.55
Bio-available Sulphur (as S)	%	0.26
Bio-available Magnesium (as Mg)	%	2.10
Bio-available Boron (B)	(ppm)	99
Bio-available Copper (Cu)	(ppm)	62
Bio-available Iron (Fe)	(ppm)	1,942
Bio-available Manganese (Mn)	(ppm)	93
Bio-available Molybdenum (Mo)	(ppm)	28
Bio-available Selenium (Se)	(ppm)	7.8
Bio-available Zinc (Zn)	(ppm)	3,435

LABORATORY RESULTS (cont.)

Heavy Metal Analysis of Substrate

Element	Sample 1	Sample 2	
Ag - Silver	< 0.01	0.03	
Al - Alluminium	27.93	17.42	
Ba - Barium	0.6	0.147	
Be - Beryllium	0.019	0.049	
Cd - Cadmium	0.03	0.032	
Co - Cobalt	0.081	0.062	
Cr - Chromium	2.372	2.646	
Li - Lithium	0.068	0.048	
Ni - Nickel	0.562	0.437	
Pb - Lead	<0.01	0.058	
Sb - Antimony	<0.01	<0.01	
Se - Selenium	0.851	1.206	
Sr - Strontium	1.387	0.384	
Tl - Thallium	<0.01	<0.01	
V - Vanadium	0.234	0.207	

Total Chemical Analysis of Substrate

Sample	Prot (%)	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Na (%)
Sample 1	5.688	0.91	0.018	1.276	0.006	0.002	0.155	0.030
Sample 2	6.125	0.98	0.027	1.270	0.039	0.011	0.154	0.030

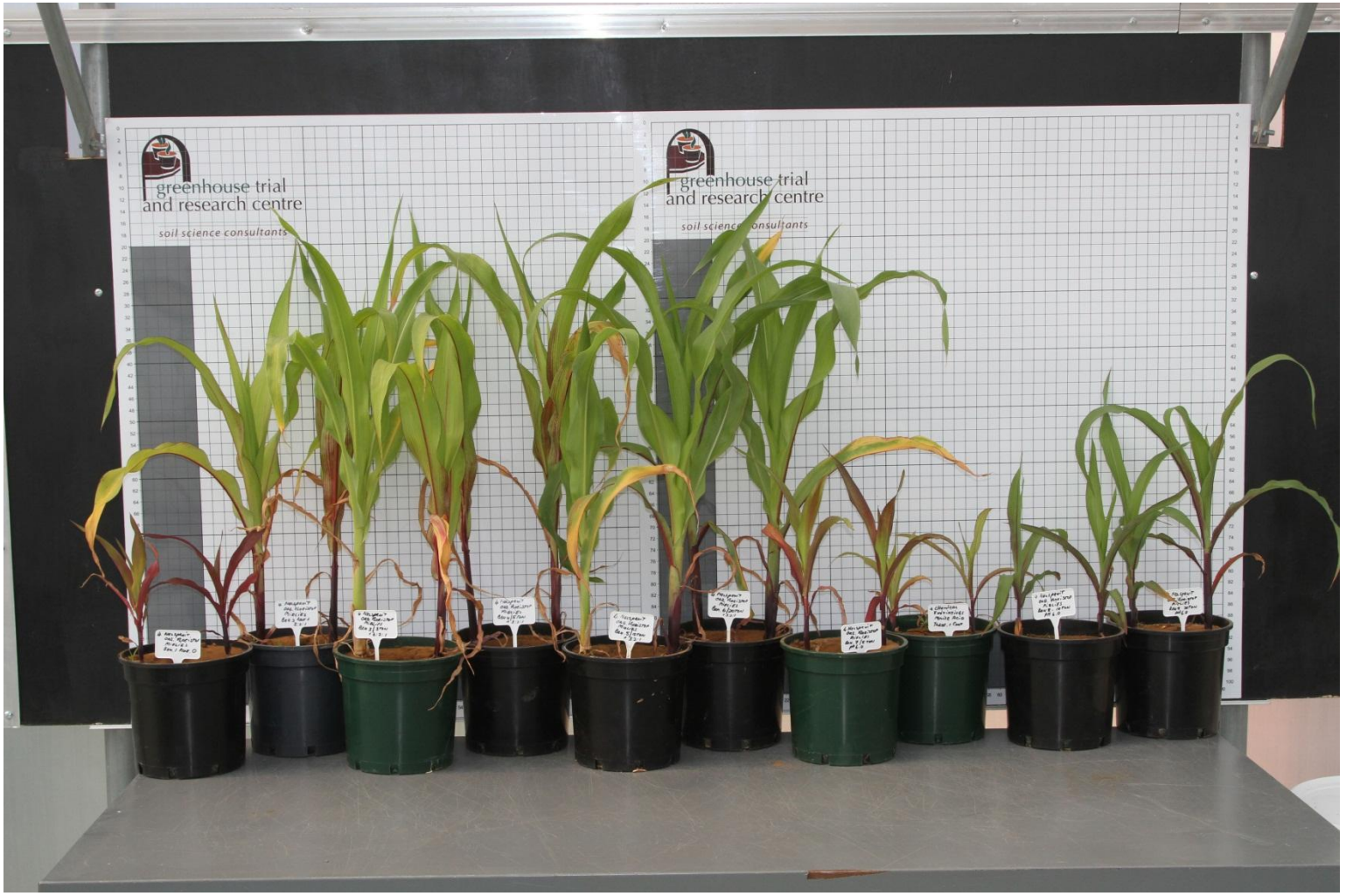
Sample	Cu ppm	Fe ppm	Zn ppm	Mn ppm	Mo ppm	B ppm
Sample 1	0.46	13.84	7.52	0.07	0.76	1.68
Sample 2	1.22	25.61	7.25	2.32	0.49	2.32

MANAGING THE HYDROLYZED PROTEIN FROM THE TISSUE PROCESSOR

A Liquid Fertilizer

The hydrolyzed protein is an excellent liquid fertilizer due to the elevated levels of Nitrogen and Potassium. The high pH, if unadjusted, can also reduce the lime requirement but pH can be tailored to suit any type of soil if a lower pH is required. Great additive to manure slurries prior to application!

MANAGING THE HYDROLYZED PROTEIN FROM THE TISSUE PROCESSOR (cont..)



HPL – Liquid Fertilizer Trial Results

	WET MASS	DRY MASS	
	grams	grams	
Control	11.4775	1.5	Not used in statistics
3:2:1(30)	110.895	20.3925	
3 ton/ha Liquid + 3:2:1(30)	147.815	26.0375	
5 ton/ha Liquid + 3:2:1(30)	147.15	26.1025	
10 ton/ha Liquid + 3:2:1(30)	149.23	25.1375	
20 ton/ha Liquid + 3:2:1(30)	157.92	27.23	
Sum	**713.0025**	**124.9**	
Average	**142.6005**	**24.98**	
Standard Deviation	**18.2454729**	**2.6697741**	
5 ton/ha Liquid pH 6	17.34	2.56	
10 ton/ha Liquid pH 6	36.63	6.2625	
20 ton/ha Liquid pH 6	58.08	9.9475	

Significant increase in bio-mass

Significant decrease in bio-mass

HPL – Liquid Fertilizer Proven Results

Table 1.Plant analysis

Treatment	N	Ca	Mg	K	Na	S	P	Fe	Mn	Cu	Zn	Mo	B	WET MASS	DRY MASS
			mg/kg					mg/kg						grams/pot	
Control	0.64	0.32	0.16	2.03	0.01	0.08	0.10	126	122	4	37	1	10	11.4775	1.5
3:2:1(30)	0.74	0.26	0.20	0.65	0.01	0.13	0.14	79	204	3	37	1	7	110.895	20.3925
3 ton/ha Liquid + 3:2:1(30)	0.63	0.19	0.15	0.82	0.01	0.09	0.13	71	106	2	25	2	8	147.815	26.0375
5 ton/ha Liquid + 3:2:1(30)	0.87	0.21	0.13	1.03	0.01	0.13	0.10	79	113	2	28	2	5	147.15	26.1025
10 ton/ha Liquid + 3:2:1(30)	1.07	0.19	0.12	1.31	0.01	0.11	0.10	71	84	3	34	1	5	149.23	25.1375
20 ton/ha Liquid + 3:2:1(30)	0.90	0.14	0.10	1.73	0.01	0.10	0.09	78	87	2	33	1	5	157.92	27.23
5 ton/ha Liquid pH 6	0.72	0.30	0.15	2.68	0.01	0.08	0.10	95	95	3	32	1	8	17.34	2.56
10 ton/ha Liquid pH 6	0.84	0.24	0.12	2.52	0.01	0.09	0.09	116	84	4	35	2	8	36.63	6.2625
20 ton/ha Liquid pH 6	0.89	0.19	0.11	2.48	0.01	0.12	0.09	96	68	3	32	2	7	58.08	9.9475

Significant increase in bio-mass	Significant decrease in bio-mass

The nitrogen and potassium showed significant increases with higher effluent applications on both the enriched as well as where only pH adjustments were made.

HPL – Liquid Fertilizer Proven Results

CONCLUSIONS AND RECOMMENDATION

Clearly the enriching of the effluent has a significant positive effect on bio-mass (yield) production.

Without enriching increasing application rates of the effluent significantly increases bio-mass production.

The effluent also contributes to the stabilization of soil pH and has a positive effect in increasing the potassium levels in the soil.

Dr J A Janse van Vuuren, Prof A S Claassens

greenhouse trial and research centre
soil science consultants

MANAGING THE HYDROLYZED PROTEIN FROM THE TISSUE PROCESSOR (CONT.)

Biogas Additive or Biomass Converter

The hydrolyzed protein from abattoir derived tissue is also an excellent feedstock for an anaerobic digestor or a biomass converter when energy recovery is the objective. This is due to the higher fat content when compared to other protein based sources without having to worry about BIOSECURITY


Photo Carcass Disposal by Alkaline Hydrolysis_Purdue_2 – Joe Wilson


Photo Carcass Disposal by Alkaline Hydrolysis_Purdue_2 – Joe Wilson

MANAGING THE HYDROLYZED PROTEIN FROM THE TISSUE PROCESSOR (CONT.)

Compost Additive

The hydrolyzed protein is an excellent compost additive and allows for easy and homogenous mixing into any basal ingredient or can be incorporated into abattoir waste streams such as paunch material without the usual concerns about pathogens and bio-security.

POTENTIAL COST RECOVERY MODEL

BOVINE ABATTOIR – EX KRUGERSDORP.

BLOOD		R/KG
COST/KG PRODUCT PROCESSED	→	0.51
POTENTIAL COST RECOVERY/KG	→	0.88
ADJUSTED COST/KG PROCESSED	→	0.37

BLOOD		1000KG
BATCH PROCESSING COST	→	506.75
POTENTIAL COST RECOVERY	→	875.00
ADJUSTED BATCH PROCESSING COST	→	368.25

TISSUE & BLOOD		R/KG
COST/KG PRODUCT PROCESSED	→	0.67
POTENTIAL COST RECOVERY/KG	→	0.85
ADJUSTED COST/KG PROCESSED	→	0.18

TISSUE & BLOOD		2000KG
BATCH PROCESSING COST	→	1 347.50
POTENTIAL COST RECOVERY	→	1700.00
ADJUSTED BATCH PROCESSING COST	→	352.50

TISSUE ONLY		R/KG
COST/KG PRODUCT PROCESSED	→	0.99
POTENTIAL COST RECOVERY/KG	→	1.50
ADJUSTED COST/KG PROCESSED	→	0.51

TISSUE ONLY		1000KG
BATCH PROCESSING COST	→	986.25
POTENTIAL COST RECOVERY	→	1500.00
ADJUSTED BATCH PROCESSING COST	→	513.75

CONCLUSIONS

Benefits of the MAAHP Tissue Processing System

- ✓ Fast , Consistent, Energy Efficient, Low odor process.
- ✓ Low Labor & Management Requirements
- ✓ Complete System, small footprint, robust design
- ✓ Offers excellent bio-security.
- ✓ Allows on-site treatment of a wide variety of tissue without the need to sort.
- ✓ Prevents re-entry of treated material into the food chain.
- ✓ Provides true denaturing as required by law
- ✓ Provides Cost Recovery Options

Contact Waste Resolution Technologies

MARK TECKLENBURG

Managing Director

CELL: 083 375 8326

FAX : 0866 9588 53

EMAIL: mark@waste-resolution-technologies.com

PIET KRUGER

Technical Director

CELL: 082 8414 996

FAX : 0866 9588 53

EMAIL: piet@waste-resolution-technologies.com

WEB : waste-resolution-technologies.com