

**RECYCLING
OF
IWK SLUDGE
INTO
GREEN FERTILIZER**

By

Leong Man Loong

Introduction Of BIOSOLIDS

What are Biosolids?

They are nutrient-rich organic materials resulting from the treatment of domestic sewage in a treatment facility.

When treated and processed, these residuals can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth.

What is the difference between biosolids and sludge?

Biosolids are treated sewage sludge.

Biosolids are carefully treated and monitored and must be used in accordance with regulatory requirements.

How are biosolids used?

After treatment and processing, biosolids can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth.

The controlled land application of biosolids completes a natural cycle in the environment.

By treating sewage sludge, it becomes biosolids which can be used as valuable fertilizer, instead of taking up space in a landfill or other disposal facility.

Where are biosolids used?

Farmers and gardeners have been recycling biosolids for ages in Southeast Asia.

Biosolids recycling is the process of beneficially using treated residuals from wastewater treatment to promote the growth of agricultural crops, fertilize gardens and parks and reclaim mining sites.

Land application of biosolids takes place in all 50 states in the USA.

Why are biosolids used on farms?

The application of biosolids reduces the need for chemical fertilizers.

As more wastewater plants become capable of producing high quality biosolids, there is an even greater opportunity to make use of this valuable resource.

What percentage of biosolids are recycled and how many farms use biosolids?

Based on biosolids application in the USA, about 50% of all biosolids are being recycled to land.

These biosolids are used on less than one percent of the USA's agricultural land.

Are biosolids safe?

The National Academy of Sciences in USA has reviewed all the current practices, public health concerns and regulator standards of biosolids.

It has concluded that

"the use of these materials in the production of crops for human consumption when practiced in accordance with existing federal guidelines and regulations, presents negligible risk to the consumer, to crop production and to the environment."

Do biosolids smell?

Biosolids may have their own distinctive odor depending on the type of treatment it has been through.

Some biosolids may have only a slight musty, ammonia odor.

Much of the odor is caused by compounds containing sulfur and ammonia, both of which are plant nutrients.

Are there regulations for the land application of biosolids?

The USA's federal biosolids rule is contained in 40 CFR Part 503 rule governing the use and disposal of biosolids contain numerical limits ***similar requirements*** for biosolids that are ***surface disposed or incinerated***.

Metals in biosolids

Pathogen reduction standards

Site restriction

Crop harvesting restrictions and monitoring

Record keeping

Reporting requirements for land applied biosolids

How are biosolids used for agriculture?

Nutrients found in biosolids, such as nitrogen, phosphorus and potassium and trace elements such as calcium, copper, iron, magnesium, manganese, sulfur and zinc, are necessary for crop production and growth.

The use of biosolids reduces the farmer's production costs and replenishes the organic matter that has been depleted over time.

The organic matter improves soil structure by increasing the soil's ability to absorb and store moisture.

How are biosolids used for agriculture?

The organic nitrogen and phosphorous found in biosolids are used very efficiently by crops because these plant nutrients are released slowly throughout the growing season.

This enables the crop to absorb these nutrients as the crop grows.

This efficiency lessens the likelihood of groundwater pollution of nitrogen and phosphorous.

Can biosolids be used for mine reclamation?

Biosolids have been used successfully at mine sites to establish sustainable vegetation.

Not only does the organic matter, inorganic matrix and nutrients present in the biosolids reduce the bioavailability of toxic substances often found in highly disturbed mine soils, but also regenerate the soil layer.

This regeneration is very important for reclaiming abandoned mine sites with little or no topsoil.

How are biosolids used for forestry?

Biosolids have been found to promote rapid timber growth, allowing quicker and more efficient harvest of an important natural resource.

**Introduction
Of
GREEN FERTILIZER**

IT IS RECYCLING.....

Returning treated sewage to soils is recycling
NUTRIENTS & ORGANIC MATTER

HOMES

BUSINESSES & INDUSTRY

PLANTS & SOIL



Sewage



SEWAGE TREATMENT



RECYCLING FACTORY



GREEN FERTILIZER



What is Green Fertilizer?

Green Fertilizer is a slow-release organic fertilizer that provide a steady supply of plant nutrients over an extended period of time.

Green Fertilizer instead breaks down slowly, keeping nutrients in the soil and available to the plants. This helps the plants get the nutrients they need and greatly reduces negative impacts to streams.

One of the major benefits to organic fertilizers is they add to the composition of the soil (a very big perk to gardeners). They help to hold in moisture and promote healthier root growth. They naturally help to maintain the pH balance in the soil.

What is Green fertilizer made of?

Green Fertilizer is a fertilizer made of inorganic nano pores filler with nutrient rich and highly treated solids sludge from IWK sewage sludge treatment plant.

Green Fertilizer can be used to improve and maintain productive soils and stimulate plant growth.

How is Green Fertilizer produced?

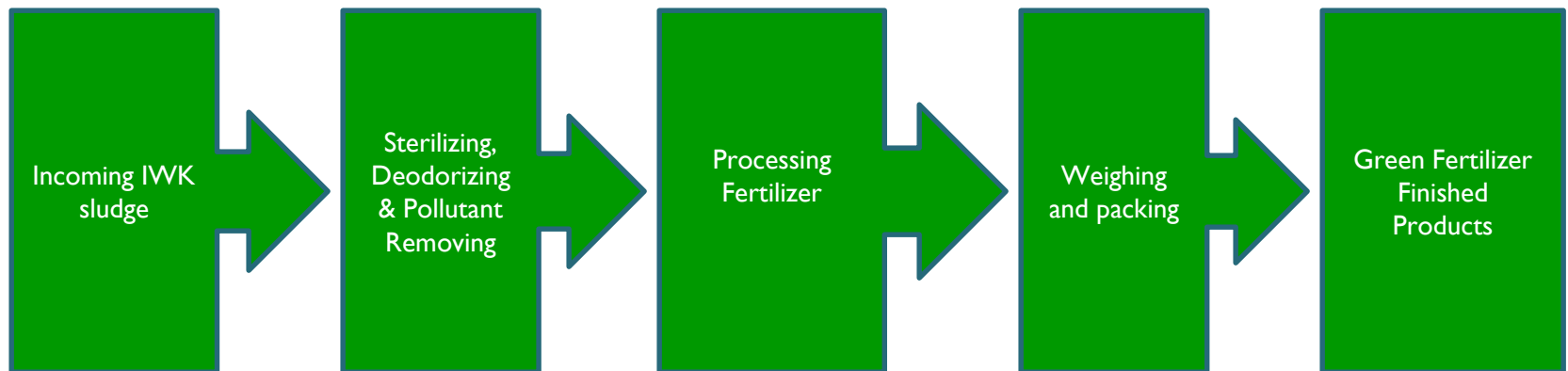
Treated sewage sludge ready for landfill disposal are taken from Indah Water Konsortium (IWK).

The sludge will go through sterilizing, deodorizing and pollutant removing processes through nanobiotech formulation. The treated sludge are further processed into fertilizer.

Continue....

How is Green Fertilizer produced?

This Green Fertilizer exceed requirement of exceptional quality (EQ), Class A biosolids. Per EPA: Class A biosolids contain no detectible levels of pathogens. Class A biosolids that meet strict vector attraction reduction requirements and low levels metals contents, only have to apply for permits to ensure that these very tough standards have been met.



Manufacturing Process of Green Fertilizer

What does the 0.8-8.35-0.34 mean?

Important nutrients for plants (referred to as macro-nutrients) are nitrogen, phosphorous and potash (N-P-K).

The three big numbers on fertilizer labels show how much plant macro-nutrients they contain.

Green Fertilizer contains a minimum of 0.8% Nitrogen, 8.35% Phosphorous and 0.34% Potash.

Is it safe for pets and children?

The result from independent laboratory shows Green Fertilizer meets and exceeds the US EPA Part 503 under Section 503.13 Biosolids most stringent requirements for fertilizers.

The product is subjected to the state of art nanobiotech formulation to eliminate any harmful pathogens and pollutants.

The end result is a pathogen free, earthy smelling product, which is non-toxic.

We do recommend that you store the fertilizer in an area away from pets and children as with any other fertilizer or garden products.

Are there concerns regarding heavy metals?

What nutritionists call “minerals” and farmers call “micro-nutrients,” chemists call “heavy metals” in biosolids.

Humans need certain nutrients in various amounts. Our macro-nutrient needs are protein, starches and sugars. We also need small amounts of micro-nutrients: vitamins (A, Bs, C, D, folic acid, etc) and minerals (calcium, magnesium, manganese, iron, zinc, boron, sulfur, molybdenum, copper and even chlorine).

Plant macro-nutrients are nitrogen, phosphorous and potash (N-P-K). Plants also need micro-nutrients, such as iron, boron, zinc, calcium, magnesium, sulfur, manganese, molybdenum, copper, cobalt and chlorine. As with humans, small amounts are required, but not too much.

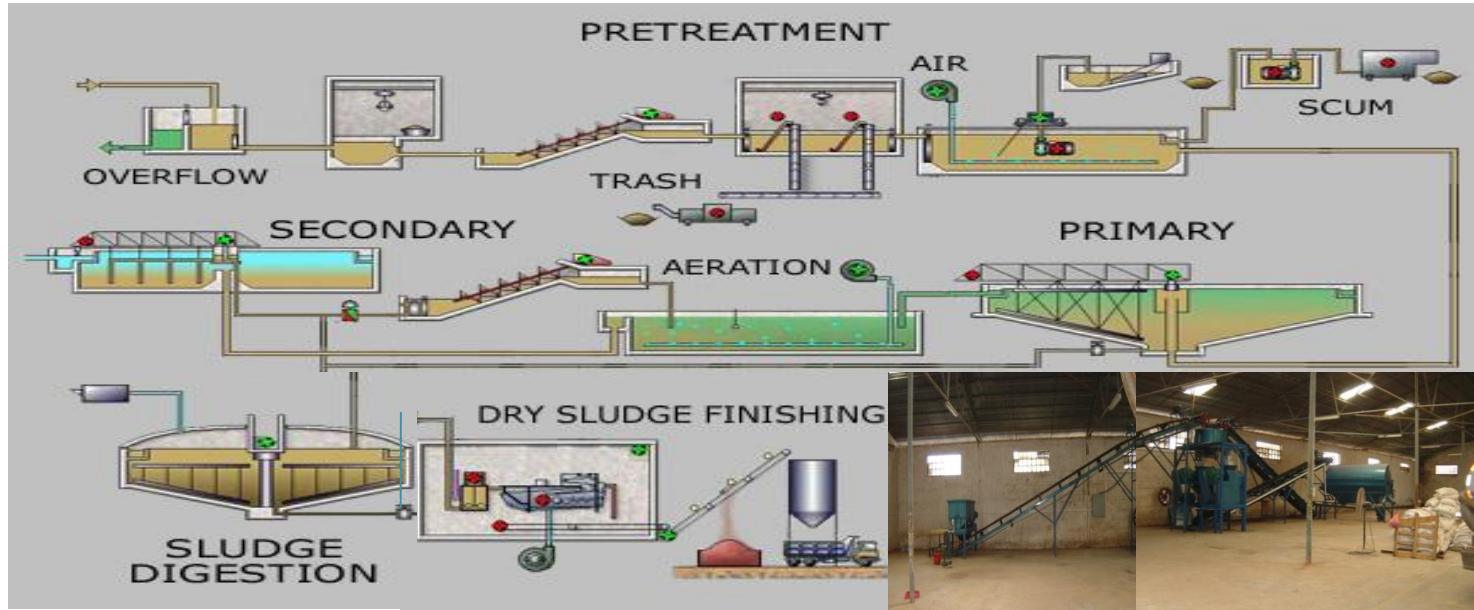
Continue....

Are there concerns regarding heavy metals?

Green Fertilizer is tested by independent laboratory for metals and other components.

It meets the U.S. Environmental Protection Agency (EPA) "Exceptional Quality" criteria which establishes the strictest concentration limits in the fertilizer industry for heavy metals.

MANUFACTURING PROCESS OF IWK SLUDGE INTO GREEN FERTILIZER



GREEN FERTILIZER AS FINISHED PRODUCTS



GREEN FERTILIZER IN PELLET FORM

Product Brochures

Green Fertilizer

Grass and Lawn Fertilizer (Odourless Organic Fertilizer)



All Natural Organic Grass Fertilizer Promotes Lush Green Grass

Looking for a chemical-free option for grass fertilizer that doesn't cost a lot and gives you a stellar lawn or pasture? Discover the easy steps to natural lawn care. Why pay a ton of money for something that isn't environmentally compatible and easy-to-use. By using all natural organic and inorganic ingredients in your grass fertilizer you can have a healthy green lawn or pasture with deep roots that are drought resistant and **REDUCE** the amount of **WATERING** and **FERTILIZING**. Semi organic grass fertilizer is safe for animals and kids.

Downside to Chemical Fertilizers

Chemical fertilizers typically put a tremendously high amount of nitrogen on your lawn creating excessive leaf development and shallow, non-drought resistant roots. Besides the fact that you have to water more often, the large amount of top growth is highly susceptible to disease causing organisms and creates a wonderful home for all those pesky insects and weeds...not to mention all the **EXTRA MOWING** you will have to do.

Chemical Fertilizer - Major Pollution Contributor

Besides taking up your precious time and/or money, lawn mowers and weed eaters are also a big contributor to pollution of our environment! That's pollution in addition to the water pollution from the chemicals. **There is a better way!**

Using an all natural semi organic grass fertilizer provides the following:

Drought resistance

Favors grass growth, not weeds

Reduced watering

Reduced mowing frequency

Balanced leaf and root development

Good stress resistance

No thatch build-up

Efficient nutrient cycling

Increased plant reserves

Stable soil

No leaching, no pollution

Increased organic matter

Increased soil aeration

Improved soil structure

Return of earthworms and microbes

No salt increase



Easy To Use

Besides all of the benefits listed, the natural semi organic grass fertilizer is easy to use. Simply spread the grass fertilizer by hand broadcasting, using a manure spreader, or by other devices. The amount of grass fertilizer is estimated between two applications of 9 kg/100 m² each, four to six weeks apart depending on the type of grass and soil condition.

Green Fertilizer

Garden Fertilizer (Odourless Organic Fertilizer)



All Natural Semi Organic Garden Fertilizer Promotes Beautiful Landscape

Looking for a chemical-free option for garden fertilizer that doesn't cost a lot and gives you a fertile soil with beautiful landscape? Discover the easy steps to natural landscape care. Why pay a ton of money for something that isn't environmentally compatible and easy-to-use. By using all natural organic and inorganic ingredients in your garden fertilizer you can have a healthy beautiful garden or pasture with deep roots that are drought resistant and **REDUCE** the amount of **WATERING** and **FERTILIZING**. Semi organic grass fertilizer is safe for animals and kids.

Downside to Chemical Fertilizers

Chemical fertilizers typically put a tremendously high amount of nitrogen on your garden creating excessive leaf development and shallow, non-drought resistant roots. Besides the fact that you have to water more often, the large amount of top growth is highly susceptible to disease causing organisms and creates a wonderful home for all those pesky insects and weeds.

Chemical Fertilizer - Major Pollution Contributor

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Increased plant reserves

Stable soil

No leaching, no pollution

Increased organic matter

Increased soil aeration

Improved soil structure

Return of earthworms and microbes

No salt increase



Easy To Use

Besides all of the benefits listed, the natural semi organic garden fertilizer is easy to use. Simply spread the garden fertilizer by hand broadcasting, using a manure spreader, or by other devices. The amount of garden fertilizer per application is estimated between 1 kg/10 m² and 0.8 kg/ 10 m² when flower buds form, depending on the type of plants and soil condition.

Comparison Tables and Test Reports

TABLE 1. Comparison Table of Pollutant Limits For Green Fertilizer from IWK, DOE Malaysia and EPA Part 503 Biosolids Rule (USA) 1995

Item	Pollutant	EPA (USA) Ceiling Concentration Limits for All Biosolids Applied to Land (mg/kg)	Pollutant Concentration Limits For EQ & PC Biosolids From USA (mg/kg)	Green Fertilizer from IWK (mg/kg)	Malaysia DOE Limit (mg/kg)
1	Arsenic (As)	75	41	0.06	5
2	Cadmium (Cd)	85	39	ND	1
3	Chromium (Cr)	3000	1200	ND	5
4	Copper (Cu)	4300	1500	0.05	100
5	Lead (Pb)	840	300	0.04	5
6	Mercury (Hg)	57	17	ND	0.2
7	Molybdenum (Mo)	75			
8	Nickel (Ni)	420	420	0.05	100
9	Selenium (Se)	100	36	ND	1
10	Zinc (Zn)	7500	2800	0.8	100
	Applies to EPA Part 503 Biosolids Rule (USA) 1995	All Biosolids that are land applied under Table 1, Section 503.13	Bulk Biosolids & bagged Biosolids under Table 2, Section 503.13		

EQ : Exceptional Quality
PQ : Pollutant Concentration

TABLE 2. Limits for land application of potentially toxic elements in sewage sludge in Malaysia, UK, USA and EU.

Potentially Toxic Element	Green Fertilizer from IWK	Malaysia Soil*	Malaysia Sludge*	UK Sludge*	USA Sludge*	EU Sludge*
Zinc	0.8	200	2000	922-1786	2800-7500	2500-4000
Copper	0.05	80	800	574-627	1500-4300	1000-1750
Nickel	0.05	50	200	65-171	420	300-400
Cadmium	ND	3	5	5-12	39-85	20-40
Lead	0.04	300	900	201-416	300-840	750-1200
Mercury	ND	1	8	3.5	17-57	16-25
Chromium	ND	300	530	208-391	-	-
Arsenic	0.06	50	35	4.0-6.3	41-75	-
Molybdenum		4	18	8.2-12	75	-

Concentrations in mg/kg dry solids.

* INTERNATIONAL JOURNAL OF WATER, Volume 2 , No. 4, 2004, Editor Professor Martin O'Connor

TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP)



CONSOLIDATED LABORATORY (M) SDN. BHD.

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SAMPLE ID : CL / AA52738 / 2009
LAB ID : CL / 33608 / 2009
BATCH NO : CL / 2009-01-16-057 - 1
DATE : 03 February, 2009
P.O NO : -

CERTIFICATE OF ANALYSIS

CLIENT : N-CRAFT SDN. BHD.
NO.68, 1ST FLOOR, JALAN SS15/4C,
47500 SUBANG JAYA,
SELANGOR DARUL EHSAN.

SAMPLE DESCRIPTION : ONE (1) SAMPLE OF GREEN FERTILIZER FROM INDAH WATER KONSORTIUM (IWK)
SAMPLE RECEIVED : 16 January 2009
SAMPLE MARKING : -

>>>PLEASE REFER RESULTS ON NEXT PAGE

LEONG KIT YEAN B.Sc., L.M.I.C.
Chemist



CL AA52738 DL

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Page 1 of 2



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SAMPLE ID : CL / AA52738 / 2009
LAB ID : CL / 33608 / 2009
BATCH NO : CL / 2009-01-16-057 - 1
DATE : 03 February, 2009
P.O NO : -

TEST PARAMETER	UNIT	TEST METHOD	SPECIFICATION	RESULT
*Arsenic (as As)	mg/kg	AAS	Max 5	0.06
*Cadmium (as Cd)	mg/kg	ICP-OES	Max 1	N.D(<0.01)
*Chromium (as Cr)	mg/kg	ICP-OES	Max 5	N.D(<0.01)
*Copper (as Cu)	mg/kg	ICP-OES	Max 100	0.05
*Lead (as Pb)	mg/kg	ICP-OES	Max 5	0.04
*Mercury (as Hg)	mg/kg	AAS	Max 0.2	N.D(<0.01)
Appearance	-	VISUAL	-	green powder
*Nickel (as Ni)	mg/kg	ICP-OES	Max 100	0.05
Organic Matter	%	Furnace Method	-	14.83
*Selenium (as Se)	mg/kg	ICP-OES	Max 1	N.D(<0.02)
Nitrogen (as N)	%	Kjeldahl Method	-	0.8
*Zinc (as Zn)	mg/kg	ICP-OES	Max 100	0.08
Moisture	g/100g	Oven Method	-	2.29
pH Value	-	pH meter	-	7.7
Phosphorus (as P2O5)	%	ICP-OES	-	8.35
Potassium (as K2O)	%	ICP-OES	-	0.34

REMARK:

- *Parameters were carried out after Toxicity Characteristic Leaching Procedure (TCLP).
- N.D - Not Detected

LEONG KIT YEAN B.Sc., L.M.I.C.
Chemist



CL AA52738 DL

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Page 2 of 2



PATHOGENIC TEST

ALS TECHNICHEM (M) SDN BHD

(117964-P)
9, Jalan Astaka U8/84, Seksyen U8, Bukit Jelutong, 40150 Shah Alam, Selangor.
Tel: (603) 7845 8257 Fax: (603) 7845 8258 E-mail: info@alsmalaysia.com



ALS Technichem

CERTIFICATE OF ANALYSIS

Page 1 of 1



DATE : 14 March 2009

OUR REF. : ATHQ/11351EV/2009

COMPANY : n-CRAFT SDN.BHD.
68, 1st Floor, Jalan SS15/4C,
47500 Subang Jaya,
Selangor
Tel: 03 - 5637 8481 Fax: 03 - 5635 5026
(Attn.: Mr. Foo)

DATE SAMPLE RECEIVED : 3 March 2009

SAMPLE DESCRIPTION : One sample

SAMPLE MARKING : Green Fertilizer from Indah Water Konsortium (IWK)

ANALYSIS RESULTS

(As per sample)

Test Parameters	Units	Results	Method References
Total Volatile Solids	%	10.4	APHA 2540 G
Faecal Coliform	cfu/g	ND(0)	APHA 9222 D
*Salmonella	Absent/Present	Absent	In-House (APHA 9260 B)

ND: Not Detected

Abs/Prs: Absent / Present

cfu/g : Colony forming unit per gram sample

APHA: Standard Methods for the Examination of Water and Wastewater, 19th Edition 1995, American Public Health Association.

* Test Not Accredited


Dian Evon
BSc. (Hons), (Applied Chem), AMIC
Chemist


Azlina Basir
B.Tech (Hons), Food Technology
Senior Microbiologist

BRANCH & COLLECTION CENTRE:

(JB): No. 19, Jalan Kencana Mas 1/1,
Tebrau Business Park, Taman Daya,
81100 Johor Bahru, Johor.
Tel : (607) - 354 9604
Fax : (607) - 354 9554

Laboratory Testing & Industrial Consultancy

470635

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LETTER OF APPROVAL FROM D.O.E.

03-AUG-2009 12:51 FROM PERUNDING CMF SDN BHD

TO 095732823

P.01/03



JABATAN ALAM SEKITAR NEGERI SELANGOR,
KEMENTERIAN SUMBER ASLI DAN ALAM SEKITAR,
TINGKAT 12-14 WISMA SUNWAYMAS,
JALAN TENGGU AMPUAN ZABEDAH C9/C,
SEKSYEN 9, 40100 SHAH ALAM, SELANGOR.
TEL: 03-55214000 FAX: 03-5519 4788



BILIK KAWALAN: 03-55197233
TALIAN ADUAN: 012-2241640
LAMARAN WEB: <http://www.doe.gov.my>
EMAIL: selangor@doe.gov.my



Pengarah Urusan
N-Craft Sdn. Bhd.
No. 68, 1st Floor
Jalan SS15/4C
47500 SUBANG JAYA

Tuan,

PERMOHONAN PENILAIAN AWAL TAPAK (PAT) DI LOT 1677, JALAN BUKIT CHEEDING BT.2, MUKIM TANJUNG DUA BELAS, DAERAH KUALA LANGAT, 42700 BANTING, SELANGOR DARUL EHSAN UNTUK TETUAN NCRAFT SDN. BHD.

Saya adalah diarah merujuk kepada permohonan tuan melalui surat no. rujukan NC/AU/JAS-SA/2009/L02 bertarikh 16 Julai 2009 berhubung perkara tersebut di atas.

2. Berdasarkan semakan maklumat dalam Borang Penilaian Awal Tapak (PAT) yang dikemukakan, Jabatan ini mendapati aktiviti yang dicadangkan berpotensi untuk menghasilkan pencemaran bau terutamanya pada bahagian pengumpulan enapomer (sludge). Oleh itu, kawalan pencemaran bau yang praktikal dan berkesan hendaklah disediakan dan diberi perhatian yang serius oleh pihak tuan. Sekiranya terdapat aduan berasas mengenai pencemaran daripada aktiviti ini, pihak tuan hendaklah bersedia mempertingkatkan langkah-langkah kawalan bagi meminimalkan kesan pencemaran tersebut. Jabatan ini pada dasarnya tiada halangan terhadap permohonan tuan di atas dengan mengambilkira ulasan Jabatan seperti berikut:-

- 2.1 Kilang di atas tapak cadangan hanya disokong untuk memproses hasil pengeluaran 'green fertilizer' daripada 'IWK dewatered sludge' sahaja dengan kuantiti 18,000 tan/sebulan;
- 2.2 Zon penampungan yang mencukupi sekurang-kurangnya 500 meter hendaklah disediakan dan dikekalkan di antara sempadan tapak dengan kawasan perumahan/institusi terhampir;
- 2.3 Alat kawalan pencemaran udara hendaklah dipasang pada bahagian proses yang menghasilkan pencemaran udara. Sebarang pelepasan bendasing ke udara dari aktiviti/proses yang dijalankan hendaklah mematuhi **Standard C**, Peraturan-Peraturan Kualiti Alam Sekeliling (Udara Bersih) 1978;

COMMUNICATIONS UNIT

(Sila catatkan rujukan Jabatan ini apabila berhubung)

03-AUG-2009 12:51 FROM PERUNDING CMF SDN BHD

TO 095732823

P.02/03

- 2.4 Sebarang pemasangan alat pembakaran bahanapi seperti janakuasa, oven, 'dryer' dan lain-lain serta cerobong yang tertakluk di bawah Peraturan 36 dan 38, Peraturan-Peraturan Kualiti Alam Sekeliling (Udara Bersih) 1978 hendaklah mendapat **Kelulusan Bertulis** berasingan dari Jabatan ini terlebih dahulu;
- 2.5 Sebarang penghasilan **Buangan Terjadual** seperti yang disenaraikan di dalam Jadual Pertama, Peraturan-Peraturan Kualiti Alam Sekeliling (Buangan Terjadual) 2005 adalah tertakluk kepada peraturan yang dinyatakan dan hendaklah dikendalikan mengikut kehendak Peraturan tersebut;
- 2.6 **Paras bunyi bising** hendaklah dikawal supaya tidak melebihi 70 dB(A) Leq pada waktu siang (7.00 pagi - 10.00 mlm) dan 60 dB(A) Leq pada waktu malam (10.00 mlm - 7.00 pagi) di sempadan premis;
- 2.7 **Pembakaran terbuka** ke atas apa-apa buangan adalah **dilarang sama sekali**;
- 2.8 Amalan 'good house keeping' di dalam dan sekitar premis hendaklah dilaksanakan pada setiap masa;
- 2.9 Sebarang cadangan **pembesaran dan peningkatan kapasiti premis** atau **pertukaran proses** perlu merujuk kepada Jabatan ini terlebih dahulu sebelum kerja-kerja tersebut dijalankan;
- 2.10 Ulasan ini adalah **terpakai** untuk tempoh selama **2 tahun** dari tarikh surat ini dikeluarkan. Sekiranya tiada projek dilaksanakan dalam tempoh tersebut, permohonan semula hendaklah dikemukakan ke Jabatan ini; dan
- 2.11 Mematuhi sepenuhnya semua peruntukan di bawah Akta Kualiti Alam Sekeliling (AKAS), 1974 dan Peraturan-Peraturan di bawahnya pada setiap masa.

3. Kerjasama pihak tuan di dalam pemuliharaan alam sekitar bagi menjamin pembangunan lestari amat dihargai.

Sekian.

"BERKHIDMAT UNTUK NEGARA"
"PEMULIHARAAN ALAM SEKITAR, TANGGUNGJAWAB BERSAMA"

Saya yang menuruh perintah,

(KHIRUDDIN MOHD IDRIS)

b.p: Pengarah
Jabatan Alam Sekitar Negeri Selangor

COMMUNICATIONS UNIT

OUR TECHNOLOGY

**Application of Nano-Encapsulation
in
Reduce, Reuse and Recycle (3Rs)
of
Biosolids into Green Fertilizer**

OBJECTIVES

The purpose of this project is to apply Nano-Encapsulation in 3Rs application to turn Biosolids into Green Fertilizer. This project will use the necessary know-how such as below:

- Formulation
- Costing
- Manufacturing Process
- Safety and Environment Factor
- Commercialization of Products

ADVANTAGES OF RECYCLING

- It reduces air pollution from sewage landfill such as methane and ammonia. These emissions contribute to global climate change, acid rain and offensive smell in the local area.
- It reduces water pollution from the sewage landfill. The water is contaminated with heavy metals such as arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc.
- It reduces pathogens such as *Ascaris Ovu* and Fecal Coliform contamination in soil and water.
- Less land area is needed for the open landfill.
- It creates new opportunity to commercialize Biosolids into environment friendly products.

3R CONCEPT (Reduce, Reuse and Recycling)

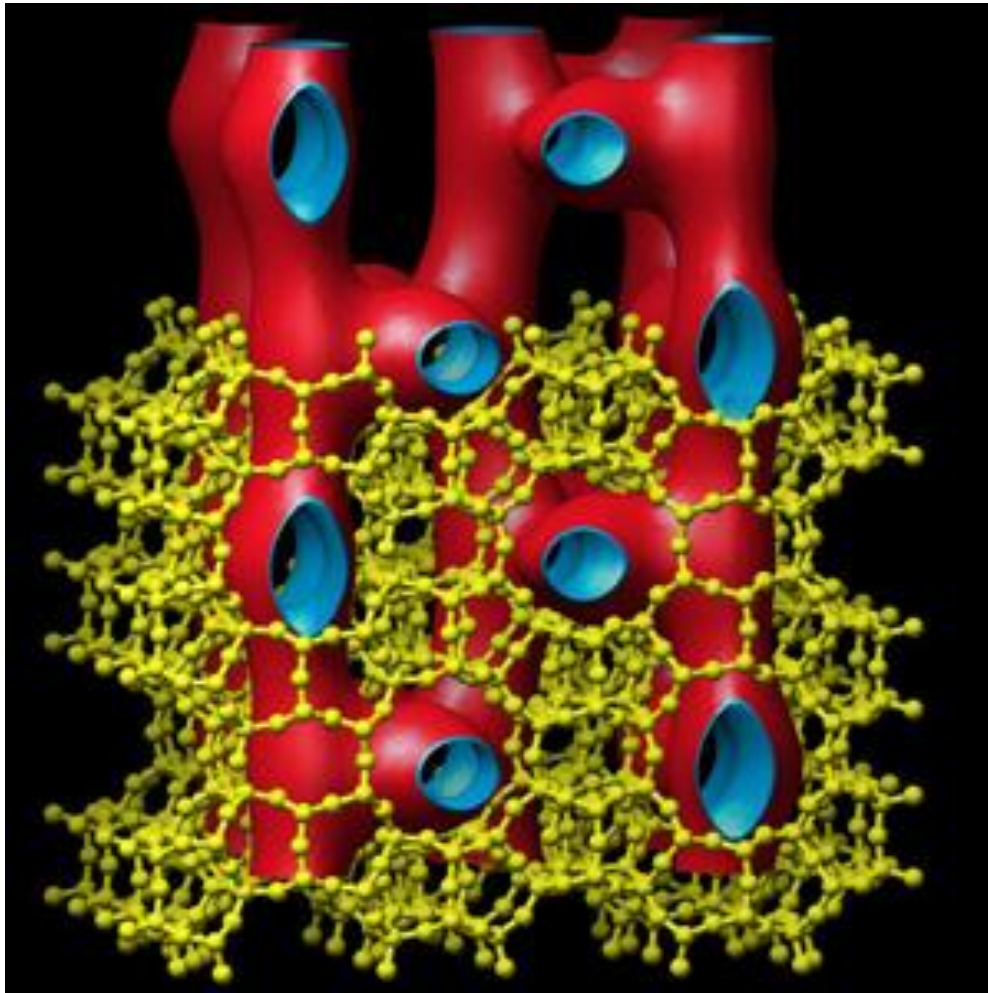
- Reduce the emissions to air such as methane and ammonia.
- Reduce water pollution through heavy metals and pathogens.
- Reduce the use of landfill.
- Reduce IWK expenses on sewage sludge disposal.
- Reuse of macro and micro nutrients in Biosolids as plant nutrients for agriculture purpose.
- Reuse of organic and fiber content of Biosolids for soil conditioning.
- Recycle of Biosolids into Green Fertilizer.

What is Nano-Encapsulation?

Nano-Encapsulation is an encapsulation process using a formulation of solid powder called 'Nanosorb'. It has a lot of nano pores, and strong properties of dehydration and sterilization which offer the following advantages:

- Porosity for Chemical and Physical Adsorption
- Infiltration
- High Cation Exchange Capacity
- Water Retention/Release Characteristics

What is Nano Pores?



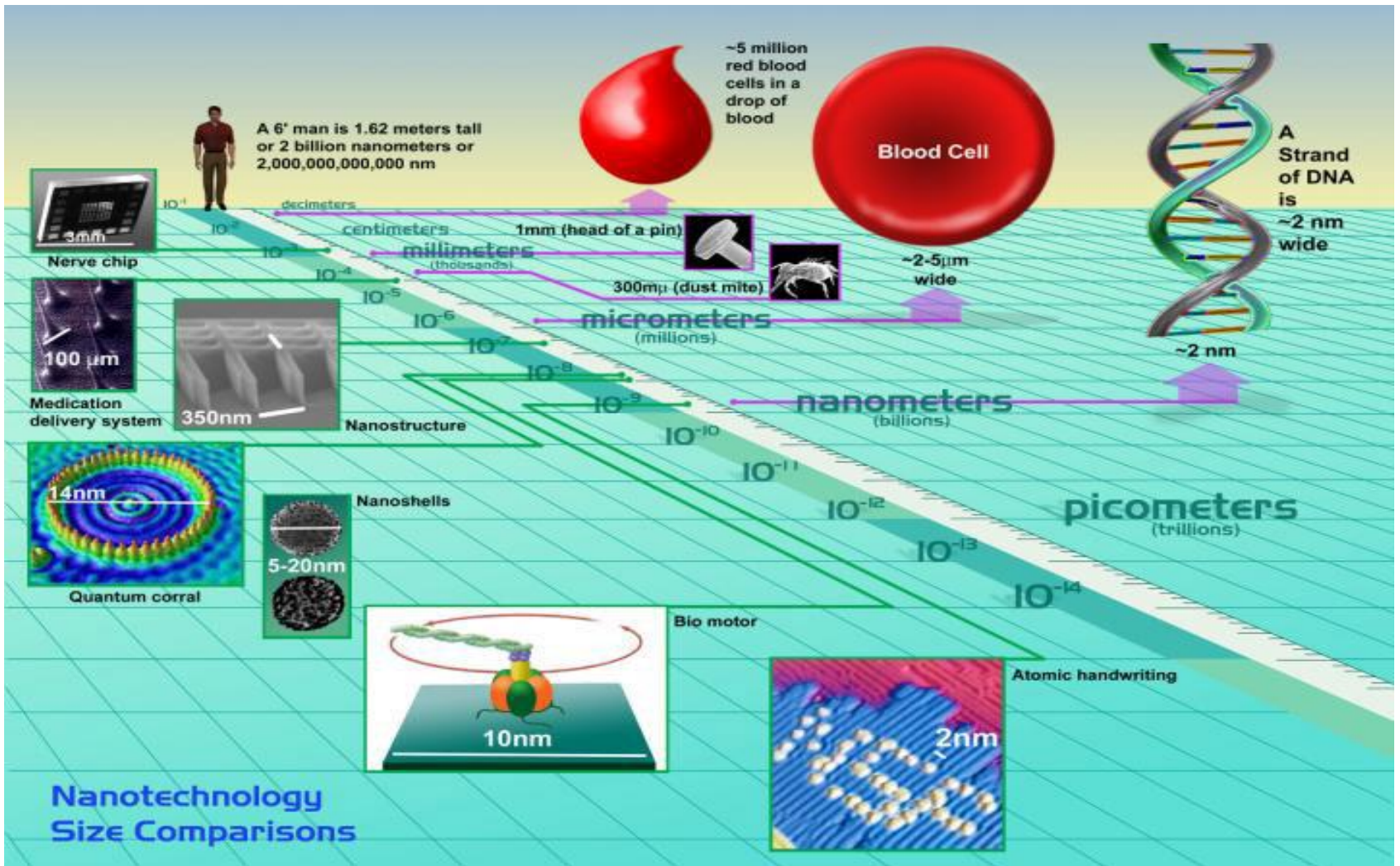
A model representation of one of the ingredients in NanoSorb's nano pores.

The yellow skeleton outlines the position of the silicon-oxygen atoms.

The red-blue tubes illustrate the unique pore system.

1 nanometer = 10^{-9} meter.

Nano Scales Comparison



Nanotechnology
Size Comparisons

WHY DO WE USE NANOSORB?

NanoSorb is an improved version of nano ingredients used by NASA as the main ingredient to develop a new kind of growth medium for space travel.

NanoSorb is made of a special crystalline structure with nano pores that are porous but remain rigid in the presence of water.

This modified improved version ingredients can be adapted for variety of uses such as below:

Aquaculture

- Ammonia filtration in fish hatcheries
- Biofilter media

Agriculture

- Odor control
- Confined animal environmental control
- Livestock feed additives

Household

- Odor control

WHY DO WE USE NANOSORB?

Horticulture

- Nurseries, greenhouses
- Floriculture
- Vegetables/herbs
- Foliage
- Tree and shrub transplanting
- Turf grass soil amendment
- Reclamation, revegetation, landscaping
- Forestry and tree plantations
- Medium for hydroponic growing

Industrial Products

- Absorbents for oil spills
- Gas separations

Radioactive Waste

- Site remediation/decontamination

WHY DO WE USE NANOSORB?

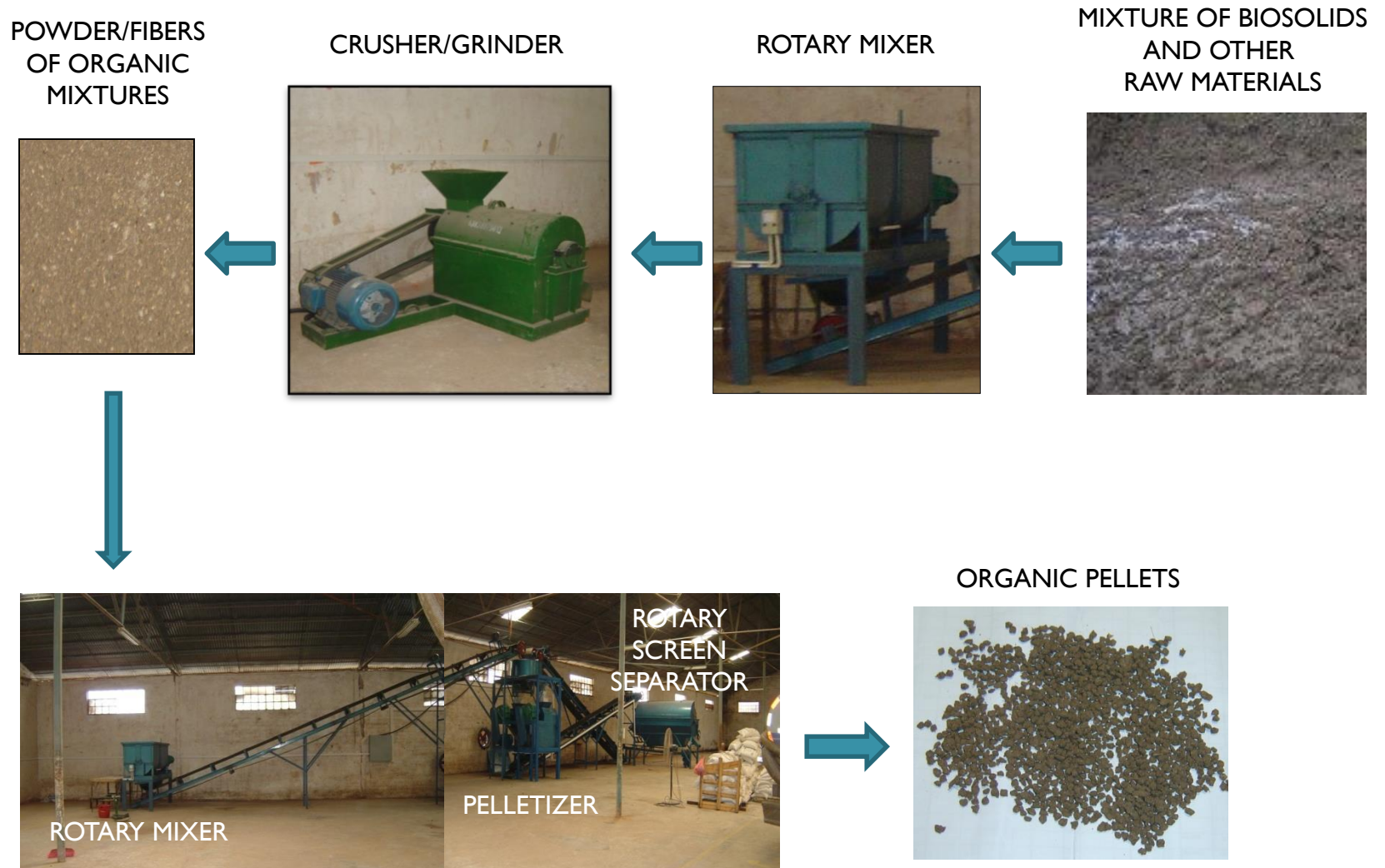
- Water treatment**
- Water filtration
 - Heavy metal removal
 - Swimming pools

- Wastewater treatment**
- Ammonia removal in municipal sludge and wastewater
 - Heavy metal remover
 - Septic leach fields

The superior performance of nano pores ingredient in odor removal, heavy metal removal, ammonia removal, oil absorption, site remediation or decontamination and vast application in agriculture and horticulture has made it the ideal choice to deal with Biosolids.

**THE
GREEN FERTILIZER
MANUFACTURING PROCESS
AND
MACHINERY**

MANUFACTURING PROCESS OF BIOSOLIDS RECYCLING



A COMPLETE MANUFACTURING LINE OF GREEN FERTILIZER.





ROTARY MIXER

CONVEYOR SYSTEM
TO PELLETIZER



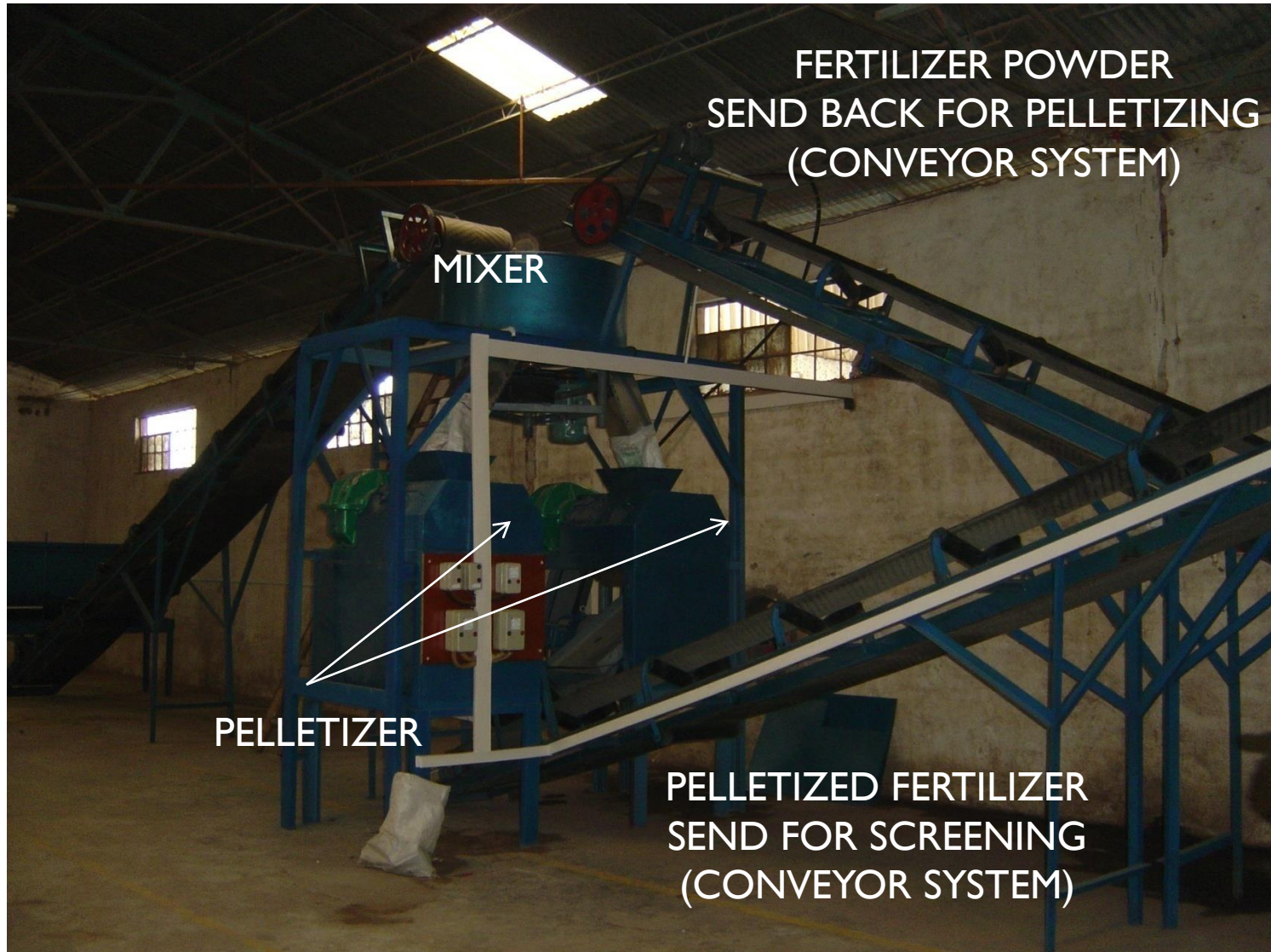
PELLETIZER MACHINE

FERTILIZER POWDER
SEND BACK FOR PELLETIZING
(CONVEYOR SYSTEM)

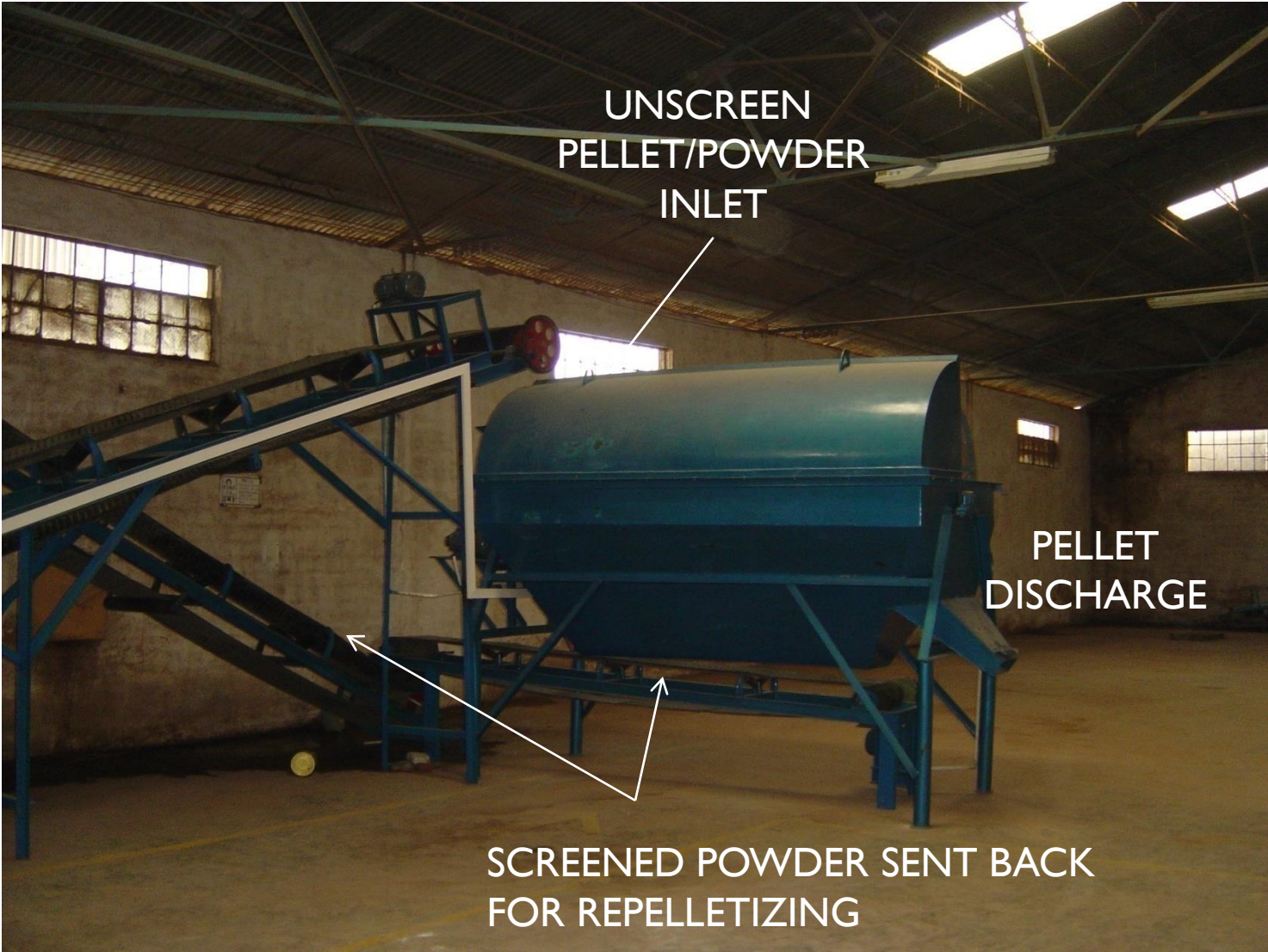
MIXER

PELLETIZER

PELLETIZED FERTILIZER
SEND FOR SCREENING
(CONVEYOR SYSTEM)



ROTARY SEPARATOR



ROTARY SEPARATOR

