Our 7 Questions for the EPA!

Cork Harbour Alliance for a Safe Environment – City Group

EPA Oral Hearing

February 2005

“Matter cannot be created nor destroyed”

Incineration is ***superficially*** a process of disposal. Waste combusted is transformed into:

- gases which go into the air
- particles which go into the air or are arrested
- ash as “fly ash” or “bottom ash”.

“Matter cannot be created nor destroyed”

- All of the heavy metals in the waste find their way into one of these phases.
- All toxic organic compounds formed during the process are emitted as gases, or particles, or in ash
- Thus all of these waste elements from incinerators pose problems for human & environmental health as well as for disposal
- An Incinerator license applicant therefore must demonstrate competency, technical expertise in defining the operation, relevant experience and have a safe and uneventful track record if these hazards are to be managed and compliance to the license guaranteed

Specific Questions on License

1. Are the Process / Operations defined ?
2. Are all potential Hazards identified
3. Is the technology BATNEEC
4. Have VOC Emissions been addressed
5. Will there be significant air pollution (deterioration of Air Quality) due to this development
6. Is the Licensee competent to operate this facility and avoid breaches of the license
7. Is the license application Valid

Specific Questions on License

Q1. Have the Process / Operations been adequately defined ?

1. Process / Operation is unknown

- There is No known characterisation of the hazardous waste to be incinerated
- All data provided by Indaver / MinChem is theoretical or indicative (as per fine print)
- Incorrect Material classifications were used in the original Application* (shows applicant does not understand hazardous nature of all waste materials)
- *The listings were revised on September 15, 2003 in follow on submissions to the EPA

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Specific Questions on License

Q2 Are all potential Hazards identified ?

2a Emissions of Particulate Matter
2b Emissions of Heavy Metals
2c Effluent Discharges
2d Materials being Handled
2e Processes being Conducted

2a Emissions of Particulate Matter

- The License applicant does not adequately address fine particulate emissions

- Particulates are a Concern because of their
  - Health effects due to Composition
  - Exposure and Transport Characteristics
  - Intensification by applicants technology

- The license applicants Pollution Control Measures do not mitigate this hazard

2a Health Risks of Fine Particulates

Fine particulate material matter emitted as a result of waste incineration is of **greatest** human health concern due to the following reasons [1]:

- They are easily transported over long distances
  - Penetrate indoors readily,
  - Reach deep into the lung,
  - The particles are most enriched in toxic compounds

(Ref 1: NRC: Waste Incineration & Human Health pg 84 as referenced,)

2a Emissions of Particulate Matter

- The **transport characteristics** of particles depend on their size
- Fine and coarse particles in ambient air differ in their chemical composition, solubility, acidity, sources, and formation processes
- Every particle in the atmosphere tends to settle to the ground through the effects of gravity
- The tendency to settle is opposed by other effects including electrostatic and aerodynamic forces
- Coarse particles are principally controlled by gravity the settling velocity is proportional to the square of the particles size
- Very Fine Particles are more controlled by electrostatic and other effects than by gravity so they deposit more rapidly than their size or the effects of gravity would suggest (hence the concentration of polluting particles around power lines etc)

2a Emissions of Particulate Matter

- Fine particles originating out doors infiltrate into homes and buildings to a greater degree than do coarse particles [1]
- Thus ambient particles penetrate indoors and are available to be breathed into the lungs [1]

(Ref 1: NRC: Waste Incineration & Human Health pg 84 as referenced,)

2a Health Risks of Fine Particulates

- Incinerators are known to produce particularly fine particulates
- “Major studies have found that there is a clear relationship between fine particulate air pollution and human deaths, and it ruled out smoking as a cause of the observed deaths”

  (Pope et al., 1995; Villeneuve et al., 2002; Pope et al, 2002) *

* See the Proof of Evidence submitted by Dr C.V Howard MB. Ch B. PhD. FRCPath. (update 30/09/2003) pg. 14 An Bord Planala Oral Hearing for a full treatment of this topic.

2a Emissions of Particulate Matter

Schedule B1 *"Emission Limits to Air"*

Dust Emission limits on the licence in Schedule B1 are in-sufficient :

- **They do not limit the particle size fraction emitted, and**
- **No onus is put on the licensee for continuous improvement with respect to this specific important parameter**

Conditions of IPC Licence for Dust Emissions

Requirement for Total Dust (mg/m^3)

- "None of the half-hourly average values shall exceed $30mg/m^3$ or,
- 97 % of the half-hourly average values over the year shall not exceed $10mg/m^3$ "

Comments: Method Iso Kinetic / Gravimetric

In theory 3 of every 100 measurements could be on average $30mg/m^3$.

However lets look at what this means

2a Emissions of Particulate matter

- The EPA Inspectors Memorandum dated 1 October 2004 page 28 makes reference to ambient monitoring for dust using PM_{10} sampling / modelling
- Reference MUST also be made to $PM_{2.5}$ levels and emission limits imposed

2a Emissions of Particulate matter

- PM10 means particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers as measured by a reference method (1)
- 1979: The US National Research Council said “measuring particles by weight, without regard to particle size, has little utility for judging effects”. Particle size is a vital consideration when it comes to air pollution and health.

2a Poor Efficiency of Air Pollution Control Equipment

- Air pollution control equipment greatly reduces emissions of total particulate matter from waste incinerators
- The type of air pollution control equipment used effects the particle size distribution of the emitted dust
- The filtration equipment is generally more effective on the larger particles
- Whilst reducing the total particulate emission, filtration equipment only changes the proportion of large to finer particulates in the resulting emissions to air

2a Efficiency of Air Pollution Control Equipment

- The bag filter technology proposed is not efficient at filtering very fine particles
- The majority of numbers of ultra-fine particles will pass through
- Current Irish standards do not consider the sizes of the particles emitted by an incinerator

Efficiency of Baghouse Filters for Fine Particles (as claimed by Operators)*

Particle Size	Collection Efficiency
PM 10’s	95% to 98%
PM 2.5	65% to 70%
PM below 2.5	5% to 30%

* IPC Application by Onyx Hampshire September 1999

Efficiency of Air Pollution Control Equipment

- Indaver's proposed fluidized bed technology is the wrong choice for best control of fine particle emissions (see Section 3 :BATNEEC)
- The evolution of particle size distribution and the composition of the bed material (***especially when fed with uncharacterised wastes***) cannot be predicted with confidence
- Fluidisation Leads to excessive escape of Fine Particles from the bed (fines) and overloading of the downstream Filters

Specific Questions on License

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2b Emissions of Heavy Metals

- Particulate matter emissions from Incinerators consists primarily of entrained non-combustible matter in the flue gas
- Products of incomplete combustion that exit in solid or aerosol form
- Chemically the ash consists of (Ref 1; pg 50)):
  - Contaminated Inorganic Ash: Mineral matter and Metallic species
  - Contaminated Carbonaceous soot formed in the combustion process
- The Incinerator will add to gross heavy metal contamination already present in the area due to the operation of the Irish Steel facility

2b Heavy Metal and Incinerator concentrated Toxic Solid Waste

These materials are of potential hazard

Because :

- They leave the combustion chamber as bottom ash or “fly (*ing*) ash”
- They contain concentrated chemicals
- Particles are reduced in size
- Material handling equipment is poor at containment of the ash leading to operator / transporter exposure
- Potential Non flue Emissions have not been assessed

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2c Effluent discharges

The applicant has not addressed the potential discharge of contaminated effluent from surface run off in the event of:

Breach of containment of tank bunds

1. Failure of more than 1 tank
2. Fire and Explosion caused through mixture of uncharacterised or incorrectly labelled waste
3. Run off or leachate from solid waste handing areas
4. Spillages of toxic ash

The Applicant has also failed to assess the potential environmental damage and clean-up cost due to such events

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Seveso II Notification

- European Communities (Control of Major Accidents involving Dangerous Substances: COMAH) Regulations, Implements the Seveso directive in Irish Legislation SI No 476 of 2000, (96/82/EC)
- This directive and Irish legislation specifies the duties of all establishments having dangerous substance in excess of application thresholds
- Under Annex 1 Appendix B of the directive named substances are classified under *Upper Tier* and *Lower Tier* categories
- An examination of the proposed inventory must be carried out to determine the establishments status or tier
- A second assessment using the International Labour Office (ILO) document *'Major Hazard Control a Practical Manual'* gives recommended separation distances from 'major hazard works ' which are defined as works in which substances stored in quantities exceeding defined thresholds are stored

Seveso II Notification

- Having carried out the required self assessments the license applicant is required to notify the H S A of the tier of operations

  6 months before construction

- However the H SA should be aware of the potential tier classification of the site during license and planning application to raise the appropriate questions

- The applicant is required to prepare a Major Accident Prevention Policy (MAPP) that describes the safety management system, risk assessment and develop on site emergency plans

- Test the emergency plans

- Inform the public

Seveso II Notification

DOMINO EFFECT / LAND USE PLANNING

- The directive also targets groups of establishments where the likelihood of a major accident is increased due to the proximity of these establishments and controls the siting of new establishments and modifications to existing sites

- Indaver has failed to give adequate notification or exercise due care in assessments of proposed stored substances

- The EPA has challenged Indaver with several errors and oversight but having received no suitable response to date the application should be discontinued

2e HAZID* Deficiencies

- No review or hazard analysis of frequent "***Swarf Fires***" in the unregulated Hammond Lane facility and their potential effect on the proposed facility
- Assumptions on the effects of flooding were incorrect and conservative
- All air dispersion modelling of effects of fires done with met data taken from Cork Airport 16 km away, different topography and presence of ***inversions*** in local area ignored
- Grouped with other establishments the site represents an overlap of major hazard event zones and is unsuitable

Review of HAZID

- No review or hazard analysis of presence of High Pressure Gas Main on site.
- Review Incorrectly concerned with a Seveso Lower Tier site only

*“**Report on Hazard Identification & Evaluation Process for Major Accident Prevention: Waste management Facility, Ringaskiddy, Indaver Ireland” Final Report,** March 2002 Byrne O Cleirigh Consultants

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2e Process / Operation is unknown

- Since the hazardous wastes cannot be classified it means that emissions and effluents cannot be reliably characterised / defined
- Wastes may contain unidentified hazards (cytotoxins, neuro toxins, hormonal agents, sensitizers, genetic modifiers)
- The incompatibility of such wastes has not been addressed adequately in the applicants submissions

2e Hazards not Identified

- Reviews by the H SA have been avoided due to misclassification and lack of clear identification of probable wastes
- Indaver don’t admit that it is a Top Tier Seveso II Site
- Mandatory Documents prepared for community review are not available via Indaver website (corrupt link)

2e Hazards not Identified

- The H SA has not been suitably alerted of the inventory of waste to allow adequate review
- Revised data in later submissions will require a lot more study to determine likely catastrophic events

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Specific Questions on License Application

Q3 Is the technology BATNEEC

3. The technology is not BATNEEC

A. Fluidised Bed Technology
B. Air Pollution Controls
C. Potential for Fires at Oxygen Levels over 10%
D. Potential for the formation of additional PCDD-PCDFs
E. Disadvantages compared to Rotary Kiln Designs
F. Testing and Inventory Management

3. The technology is not BATNEEC

A. Fluidized Bed Technology

- The proposed Technology has poor efficiency and containment of pollutants
- Harbour location causes reduced performance and efficiency problems with fluidised bed incinerators

3. The technology is not BATNEEC

B. Air Pollution Controls

- Proposed Powdered Activated Carbon Spray Treatment of Dioxin containing flue gases is inefficient and prone to fires

- High Efficiency Dioxin filters which are in widespread use in Europe have not been considered (at least 4 locations)

Dioxin removal using Powdered Activated Carbon

Best Efficiency Recorded *

97 to 99.9% and 0.40ng TEQ/m^3 @7% oxygen

EPA Draft European Limit

=< 0.1ng TEQ/m^3 @11% oxygen

* Determined EPA method 23

Dioxin removal using Powdered Activated Carbon

C. Potential for Fires at Oxygen Levels over 10%

- Gas Temp at the injection point must be maintained at levels less than 200^{o}C
- Higher temperatures suppress adsorption mass transfer and this can generate fires in accumulated solids in fabric filter hoppers and/or solids in handling equipment

Note: Waste Incinerator Gas Streams are conducted at as high a temperature as possible to prevent acid corrosion

Dioxin removal using Powdered Activated Carbon

D. Potential for the formation of additional PCDD-PCDFs

- This occurs once organic compounds are adsorbed on the surfaces of the powdered activated carbon
- During tests in 2000 total PCDD-PCDF was 2.4 times higher than input.[1]
- All Activated Carbon removed to hoppers continues to contain PCDD-PCDF compounds and the solids are therefore classed as hazardous waste

1,2: Richard J, “Non Thermal Control Techniques for Polychlorinated Dibenzo-p-Dioxins & Polychlorinated Dibenzofurans”, Portland Cement Association PCA R & D serial no 2642a

3. The technology is not BATNEEC

BAT (1997) use Catalytic Destruction Filters*

- Achieve efficiencies greater than 99%
- Do not allow additional PCDD-PCDF compounds to form so capture dust has similar levels to inlet stream
- Temperature of the gas streams have to be controlled between 180^{o}C and 260^{o}C to ensure effective catalysis without degradation of the filter fabric

* Constructed from needle punched felt impregnated with Titanium dioxide & Vanadium pent oxides tungsten catalyst and coated with PTFE on the dust side (Remedia)

www.gore.com/remedia

3. The technology is not BATNEEC

E. Disadvantages compared to Rotary Kiln Designs

- Indaver's Limited experience with Fluidized Bed Technology
- Operated at 500 to 850^{o}C
- The evolution of particle size distribution and the composition of the bed material (*especially when fed with uncharacterised waste*) cannot be predicted with confidence. This leads to overloading of downstream filters

Effect of Uncharacterised Waste

Waste Characteristic	Effect on Fluidized Bed
Sodium Content	Destroys the bed fluidity by forming eutectic structures
Corrosives	Lowers destruction Efficiencies
High Moisture Content	Reduces overall productivity of the fluidized bed process
Fusible Ash content	Binds the granular solids into large, non fluid solid destroying the fluidity

3. The technology is not BATNEEC

Rotary Kiln Characteristics [2]

- Enables thorough mixing with air
- Quantity of Fine Particles emitted is low compared with Fluidised Bed
- High Operating temperatures ensure high destruction efficiency (1100-1650^{o}C)
- Can operate in batch mode allowing more flexibility than continuous mode

3. The technology is not BATNEEC

Rotary Kiln Characteristics contd.-

- Kiln has greater resistance to high temperatures and thermal stress

- Can accept entire drums of waste removing the need for additional hazardous transfer / pumping stations

- **“Cement Roadstone” and other cement manufacturers already operate such facilities in Ireland which could be upgraded without excessive cost – these were targeted in 2002 by MinChem as potential users of blended wastes**

3. The technology is not BATNEEC

F. Testing and Inventory Management

- No routine testing of mixed waste is proposed
- Indaver also plan to accept and not re-verify customer classification of waste (Note: Payment based on classification)
- Neither continuous or statistical sampling on waste inputs and outputs are described
- Storage buffer is required to continuously feed the fluidised bed incinerator
- Buffer leads to excessive amounts of toxic and volatile waste accumulated on the site near population centres

3. The technology is not BATNEEC

F. Testing and Inventory Management

- Re-characterisation of typical arsenic and heavy metal containing waste places Indaver in a top tier Seveso II position (declared post H SA reviews)

- Indaver cannot be relied upon to correctly identify wastes without continuous sampling and composition analysis

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Specific Questions on License

Q4 Have Volatile Organic Compound (VOC) Emissions been properly addressed?

4. VOC Emissions not addressed

- No VOC Emissions (EC99/13) treatment or Management Plan presented

- Although not a prescribed process in the legislation VOC's as a consequence of handling significant quantities of Pharmaceutical Waste the applicant is not exempt from the 2002 legislation S.I. 543 "Emissions of VOC's from Organic Solvents"

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Specific Questions on License

Q5 Will there be significant air pollution - deterioration of Air Quality due to this development

5. Deterioration of Air Quality

- Air Quality in the Harbour area will deteriorate should the development go ahead
- Air emissions will add to existing ground level contamination cased by Irish steel and other harbour industries
- The proposed extension to Aghada Power Station (also contribute SO_2 & NO_x) should be considered to determine the potential cumulative effect over the next decade

5. Deterioration of Air Quality

Anticipated Airborne Emissions based on EIS
(1,ug = 0.000001g)

		Total Emissions per annum
Dioxins	4.2 pg/m^3/day	0.1 grams /Yr
Mercury	0.006 ,ug/m^3	9.6 grams/Yr
NOx	17 ,ug/m^3	27.2 Kg/Yr
Heavy Metals	0.05 ,ug/m^3	79.9 grams/Yr
Volumetric Discharge flue 1 & flue 2 max		182400 Nm^3/day

Note: Does not include the risk of large scale environmental damage from typical incinerator accidents and fires

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Specific Questions on License

Q6 Is the Licensee competent to operate this facility and avoid breaches of the license ?

6. Indaver's Poor Track Record

Competency to operate such facilities can only be assessed by taking into account an operators history:

- Indaver has had recent accidents
- Failures to detect non compliances
- 30% of all licensees breach the terms of their license*

* Source: Director Irish EPA Interview "Irish Times" Autumn. 2004

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Specific Questions on License

Q7 Is the license application Valid ?
(in light of significant discrepancies, errors & inaccuracies)

Conclusion

It is our considered conclusion that although the EPA has granted a draft licence to Indaver Ireland the licence application is invalid for the following Reasons:

Conclusion

1. Process / Operations are unknown
2. Additional Hazards were not identified
3. The technology is not BATNEEC
4. VOC Emissions are not addressed
5. There will be a deterioration of Air Quality due to this development
6. The company’s has a Poor Safety Record
7. The License application is not valid