The European Union's IPA 2013 Programme for Albania

Technical Assistance for Institution Building of the Ministry of Environment in Enforcing Environmental and Climate Acquis

(EuropeAid/135700/DH/SER/AL)

Environmental Inspection Check List – Waste Incineration/Waste to Energy

This project is funded by the European Union

Project Title:	**Technical assistance for institution building of the Ministry of Environment in enforcing environmental and climate Acquis**
Project Acronym:	IBECA
Project Number:	Europe Aid/135700/DH/SER/AL
Project starting date:	22nd June 2015
Project duration:	36 months
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Title of the Document:	**Environmental Inspection Check List – Waste Incineration/Waste to Energy**

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Date of Report: 31st March 2017

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Introduction

The IBECA project training team developed a full programme of vocational training courses following the baseline assessment work carried out at the Inception phase of the project. Since that time the project team have revised and added to that additional training content as issues have arisen during the project life and well after the initial inception period.

One of those issues that required the production of additional training course material was the proliferation of waste to energy plant construction environmental permit applications.

The IBECA project team were made aware of a number of permit applications, which had been granted, for the construction and operation of waste to energy plants (W2E) across Albania, with three initial applications for these installations at Tirana; Fier and Elbasan. The most advanced, in a developmental context, of these construction projects was in Elbasan where over the lifecycle of the IBECA project an installation has been constructed and commissioned there.

The construction and operating company, ALBTEK Energy, made the facility available to IBECA for training purposes throughout the construction and commissioning process.

This ensured that training programmes developed by IBECA had excellent field work opportunities in Environmental Impact Assessment; Environmental Permit Writing and Inspection and finally in regard to the Environmental Monitoring considerations of these W2E installations.

One of the outcomes from this process was the joint initiative between the State Inspectorate for Environment and Forests (SIEF) and the Monitoring Specialist from the Regional Environment Agencies (REA) to rectify a significant issue with the current crop of Type A and B Environmental Permits in circulation.

Environmental Permits at Type A and B are all copy and paste versions of the legal format defined in the Permitting Law. This would be acceptable to some extent if the template was copy and paste BUT the content was specific to any given installation. This is particularly important when it comes to condition 7 on Monitoring at Installations. Different industry sectors have different emissions and different installations have different monitoring points.

Unfortunately, the current situation with the environmental permits in circulation has resulted in every installation having the exact same number of monitoring points and in addition there is a complete lack of emissions data in the monitoring conditions tables. This is despite the fact that this data is actually available in current legislation.

The challenge for the authorities now is to rectify these current permit deficiencies and to bring them into line with basic environmental permit requirements for industrial installations.

IBECA have proposed a solution to this problem involving the key stakeholders from the sector and this solution has been published in a separate report output of IBECA. It was therefore important that IBECA used the W2E plant training as an opportunity to address environmental permit conditions in the context of industry sector specifics.

One of the direct outputs of the work done at the W2E plant, with the inspectors and agency staff, was therefore the preparation of an inspection/monitoring checklist specifically for waste to energy

plants. This will ensure that both at the permit writing and inspection phases of the permitting process all aspects of such installations are considered by the Inspectorate and the Agency.

Annex 1 contains the checklist prepared by IBECA under Activity B.2: Development of the Competence of the State Inspectorate.

This checklist should be used in conjunction with the Waste Incineration Directive and both the Waste Incineration and Waste Treatment BREF Documents.

Users of this checklist should also familiarize themselves with the Emission Limit Value tables and guidance developed by IBECA.

Annex 1: Environmental Inspection Check List – Waste Incineration/Waste to Energy

Name of Installation:		**Date of Inspection:**	
Permit No.		**Lead Inspector:**	
Inspection Team:			
Installation Representative and Position:			

Item Ref.	Inspection Item	Compliant (Yes; No or Not Applicable*)
Design, Equipment and Operation of the Plant		
1	Does the installation contain more than one incineration line?	
2	What are the maximum design capacity and the maximum total incineration capacity of the plant (in t/h)?	
3	Is any hazardous wastes incinerated?	
4	Are the operating temperatures, after last injection of combustion air, 1,100°C for hazardous waste with greater than 1% halogenated hydrocarbons expressed as chlorine, or 850°C for all other wastes?	
5	In case operating temperatures are lower, derogation under Article 6(4) Waste Incineration Directive must be available?	
6	What is the residence time of gas at the operating temperatures given above?	
7	In case residence time is less than 2 sec, derogation under Article 6(4) Waste Incineration Directive must be available?	
8	What is the technique applied in order to verify the gas residence time and the minimum operating temperatures given, both under normal operation and under the most unfavourable operating conditions anticipated, in accordance with WID Article 6(4).	
9	Is the temperature in the combustion chamber measured in accordance with Article 6(1) Waste Incineration Directive?	
10	Is an automatic system to prevent waste feed under particular circumstances described in accordance with Article 6(3) and 6(4) Waste Incineration Directive?	
11	Does the plant use oxygen enrichment in the incineration combustion gas? If yes, what is the oxygen concentration in the secondary air (% oxygen)?	
12	Are for each line, at least one auxiliary burner installed to switch on automatically whenever the furnace temperature drops below a set value?	
13	Which fuel type is used during start-up/shut-down? If other fuels than natural gas, LPG of light fuel oil/gasoil is used; can it be proven that the used fuel will not give rise to higher emissions?	
14	Are pre-treatment methods required to ensure that the quality standards for Total Organic Carbon (TOC) content or Loss of Ignition (LOI) of the bottom ash or slag are achieved? If yes, is a description available?	

Item Ref.	Inspection Item	Compliant (Yes; No or Not Applicable*)
15	Is roofing and drainage segregation provided to minimise contamination of rainwater? And is sufficient storage capacity available for contaminated rainwater to allow sampling and testing prior to release?	
Incoming Waste Management		
16	Is for each type of waste burned the following information provided: waste description, EWC classification number, annual disposal in [t], statement whether it is hazardous waste?	
17	In case hazardous waste is treated, is additional information such as hazardous waste category, names and maximum concentration, waste composition, calorific value, etc. available?	
18	Is any fraction of the hazardous waste generated by the installation of which the incinerator is a part?	
19	How is it ensured that the information about the mass of waste to be delivered is available before it is received? (Article 5(2) Waste Incineration Directive)	
20	Are requirements of Article 5(3) Waste Incineration Directive satisfied? (requirements for hazardous waste streams)	
21	Are representative samples taken from the hazardous waste stream? What is the retention period of samples after incineration of the batch has been completed? Minimum is 1 month (Article 5(4) (b) Waste Incineration Directive).	
22	Is infectious clinical waste incinerated (as defined in Annex III WFD)? If yes, will the material go straight from storage into furnace without being mixed with other categories of waste and without direct handling during loading of the furnace as required by Article 6(7) Waste Incineration Directive?	
23	Is incoming waste pre-treated to the degree necessary to reduce variations in feed composition, to control emissions and to prevent unnecessary waste production?	
24	Are vehicles load/unload in designated areas provided with proper hard standing?	
25	Is uncontained or potentially odorous waste stored inside buildings with suitable odour control e.g. negative pressure created by feeding combustion air, automatic or restricted size doorways?	
26	Is fire fighting equipment, in accordance with the requirements of Local Fire Officers, provided (especially for Municipal Solid Waste (MSW) reception bunkers, clinical and chemical wastes storage)?	
27	Are fuels and treatment chemicals stored in appropriate tanks or silos (possibly with closed loop vapour systems and	
Municipal Waste Incineration		
28	Are all relevant legislative requirements fulfilled?	
29	Is municipal waste delivered in covered vehicles or containers and unloaded into enclosed reception bunkers or sorting areas with odour control?	
30	Are design and handling procedures used to avoid any dispersal of litter?	
31	Are techniques applied to increase the homogeneity of waste fed to the incinerator?	
32	Is it ensured (through inspection) that any waste, which would prevent the incineration from operating in compliance with the permit, is separated and placed in a designated storage area until its removal?	
33	Are proper measures taken to minimise odour in any potentially odorous indoor areas (e.g. self-closing doors, ventilation, treatment of extracted air, storage times, monitoring quality of incoming waste, etc.?	

Item	Inspection Item	Compliant

Ref.		(Yes; No or Not Applicable*)
Waste Charging		
34	Is an automatic system used to prevent waste feed at start-up, whenever the required temperature is not maintained, whenever the continuous monitors show that any emission limit value is exceeded?	
35	Is the waste charging interlocked with furnace conditions?	
36	Is it ensured that the charging operation is as airtight as possible and the fan control system is capable of responding to charges in furnace pressure during charging, to avoid escape of fumes or excess air flows?	
37	Are mechanisms that load the chute interlocked to prevent loading under the conditions outlined by the Waste Incineration Directive? (in systems that use a waste filled charging chute or hopper to achieve an airtight seal)	
38	Are procedures in place to ensure that the designed charging rate is not exceeded?	
39	Are throughput rates not exceeded and are they recorded (as declared in the permit)?	
40	Are mass throughput rates adjusted in a way to ensure optimum combustion conditions, while maintaining sufficient waste residence in the chamber?	
41	Are sealed delivery chambers used if there is a risk of either waste or products of combustion escaping from the feed mechanism?	
42	Is the waste feed engineered to prevent backflow of combustion products through it? And is a low-level alarm included in the feed hopper?	
43	Are isolation doors that prevent the fire burning back up the chute double doors or have a cooling system?	
44	Do the operating procedures show how overloading of the furnace will be prevented?	
45	Is it ensured that clinical waste is placed straight from storage into the furnace, without first being mixed with other categories of waste and without direct handling (Waste Incineration Directive requirement)?	
Residues Management **General:**		
46	How are the residues from the incineration plant minimised, recovered, recycled and disposed of?	
47	Is a description given on how it is intended to minimise the harmfulness of residues and how they will be recycled where this is appropriate?	
48	Is at least the following information available for each waste disposed of; incineration line identifier, residue type reference, source and description of residues, details of transport and intermediate storage, details of the total soluble fraction and soluble heavy metals fraction and the route by which the residues will leave the installation (e.g. recycling, recovery, disposal to landfill)?	
49	Are requirements of Article 6(1) Waste Incineration Directive met (i.e. TOC content of slag and bottom ash is less than 3 %, or their LOI is less than 5 % of the dry weight of the material?	
Bottom ash:		
50	Is it ensured that dust does not become airborne (in case ash is handled dry)?	
51	In case ash is handled wet, is it ensured that ash is fully drained before it is transferred to the skips or otherwise leaves the site?	
52	Are all ash transport containers covered?	
53	Is adequate cleaning equipment such as vacuum cleaner provided and maintained?	

Item	Inspection Item	Compliant

Ref.		(Yes; No or Not Applicable*)
Fly ash and Air Pollution Control (APC) residues:		
54	Are fly ash and APC residues segregated in order to allow the individual streams to be re-used or recycled?	
55	Are these streams carefully stored, handled and transported, whether alone or in combination?	
56	Is fly ash stored and transported in a manner that prevents fugitive dust releases?	
57	Is the displaced air, during silo and container filling, ducted to suitable dust arrestment equipment?	
58	Are dry residues for disposal handled in sealed containers such as tankers for large quantities or for instance “big-bags” for smaller installations?	
Rejected feedstock:		
59	Are techniques for the inspection of waste adopted (e.g. nature of the waste, the ability of the installation to treat the waste incl. any pre-treatment/waste mixing etc.) to decide whether to accept/reject the waste?	
60	Is it ensured that the delivery of waste that cannot be processed at the facility is minimised?	
61	Are provisions made for safe storage of rejected loads in a designated area with contained drainage?	
62	Are procedures in place for dealing with such loads to ensure that they are safely stored and dispatched for onward disposal?	
63	Is it ensured that storage times are minimised?	
Recovered waste fractions:		
64	Are provisions made for the storage of all recovered waste fractions?	
65	Are the waste disposal/recovery routes regularly audited to ensure proper waste treatment?	
66	Is it justified why recovery is technically or economically not feasible (where disposal occurs)?	
67	Is a detailed assessment provided, identifying the best environmental options for waste disposal?	
Continuous Emissions Monitoring		
68	How is it ensured that the requirements set in Article 11(11) Waste Incineration Directive are satisfied? (half- hourly/10-minute average, etc.)	
69	Are details on the definition when start-up ends and shut-down begins provided?	
70	Are all types of unavoidable stoppage, disturbance or failure of the abatement plant or continuous emission monitoring system described?	
71	Will the value of the 95 % confidence intervals of a single measured value of the daily emission limit value, exceed the percentages of the emission limit values required by Article 11(11) Waste Incineration Directive and Annex III Point 3?	
72	Is the monitoring of process variables described? (For emissions into air, at least the arrangements for monitoring oxygen content, temperature, pressure and water vapour content must be included (Article 11(7) Waste Incineration Directive). For emissions of waste water from the cleaning of exhaust gas, at least the arrangements for monitoring pH, temperature and flow rate must be included. (Article 8(6) Waste Incineration Directive)	
Emissions into Surface Water and Sewer		
73	Are details on the applied waste water treatment process available?	
74	Is it demonstrated that the requirements of Annex IV and Article 8(4) and 8(5) Waste Incineration Directive are fulfilled? (i.e. application of the mass balance requirements)	

Item Ref.	Inspection Item	Compliant (Yes; No or Not Applicable*)
75	What are the storage arrangements for contaminated rainwater run-off? Is the storage capacity adequate to ensure that such waters can be tested and, if necessary, treated before discharge (Article 8(7) Waste Incineration Directive)?	
76	Are benchmark data for the main chemical constituents for normal operating /possible emergency conditions available for each emission point?	
77	How are the pollutants monitored in these emissions?	
78	Is information on flow rate, pH and temperature available?	
79	Are for each monitoring parameter the emission points, the monitoring frequency, the monitoring method, whether the equipment/sampling/lab is certified, the measurement uncertainty, etc. defined?	
80	Are any different arrangements necessary during start-up and shut-down?	
81	Is any additional information provided on monitoring and reporting of emissions into water or sewer?	
Emissions into Air		
82	Are the emission limit requirements of the Waste Incineration Directive fulfilled (as a minimum)?	
Particulate matter:		
83	Are fabric filters installed, correctly operated and maintained?	
84	Are bag burst detectors provided to indicate the need for maintenance when a bag fails?	
85	Are fabric filters with multiple compartments used, which can be individually isolated in case of individual bag failure?	
86	Where wet scrubbing is used in combination with fabric filters, are the cool and wet gases reheated to prevent dew point and other problems?	
87	Is wet scrubbing used in combination with fabric filters (wet scrubbers on their own are not BAT)?	
Primary NO_X measures:		
88	Is nitrogen rich waste burnt (e.g. sewage sludge)?	
89	Are low NO_X burners for burning liquid waste or for supplementary firing used?	
90	Are starved air systems used where appropriate? (reduction of oxygen content and temperature)	
91	Is all equipment sealed to prevent fugitive air ingress and is it maintained under slight negative pressure to allow control of air input and to prevent combustion gas releases?	
92	Is primary and secondary air feed optimised so that conditions in the combustion chamber secure oxidative combustion of gases, while not resulting in higher NO_X production?	
93	Are computerised fluid dynamics (CFD) used to optimise the primary and secondary air input?	
Primary NO_X measures:		
94	Are excessive or uneven temperatures avoided which may lead to higher NO_X formation? (minimum temperature requirements imposed by the Waste Incineration Directive must be maintained)	
95	Is Flue Gas Recirculation (which provides an effective means of NO_X prevention) applied, optimised and controlled?	
Secondary NO_X measures:		
96	Are secondary NO_X measures considered after the application of primary NO_X reduction measures?	

Item Ref.	Inspection Item	Compliant (Yes; No or Not Applicable*)
Selective non-catalytic reduction (SNCR):		
97	Are NH_2 –X compounds/ammonia/urea injected into the furnace to reduce emissions of NO_X and inhibit dioxin formation?	
98	Is the addition of reagents controlled to minimise the possibility of ammonia slippage?	
Selective catalytic reduction (SCR):		
99	Is SCR applied? (reduction of NO, NO_2 to N_2 and reduction of VOCs, CO and dioxin emissions)	
100	Is the use of SCR considered in the cost benefit assessment and is a justification provided if it is not employed?	
Primary acid gas measures:		
101	Is it ensured that releases are influenced through waste selection (e.g. up-stream waste management to prevent the inclusion of problematic wastes, waste selection or segregation techniques)?	
102	Are low sulphur fuels <0.2 % w/w used for start-up and support?	
Secondary acid gas measures:		
103	Is the selection of the technology (i.e. wet, dry and semi-dry) and the selection of the reagents justified?	
Alkaline reagent dosing control:		
104	Is the reagent dosing system optimised to control acid gas emissions within emission limit values, reduce consumption of reagent and reduce production of alkaline residues?	
Other releases (CO_2, CO and VOCs):		
105	Are raw materials with low organic matter content and fuels with low ratio of carbon content to calorific value preferred?	
106	Is it ensured that furnace and combustion requirements are fulfilled?	
107	Are consistent waste feed characteristics (e.g. Calorific Value (CV), moisture) and feed rates secured?	
108	Are partially oxidised gases burned before release?	
Dioxins and furans		
109	Are combustion conditions carefully controlled (i.e. gas residence times, temperatures and oxygen contents at the combustion stage)?	
110	Is it ensured that the conditions for de novo synthesis are avoided by ensuring that exit gas streams are quickly cooled through the de novo temperature region between 450 °C and 200 °C?	
111	Is efficient particulate abatement in place, which will remove dioxins/furans from the gas phase (e.g. bag filters impregnated with catalyst specifically developed for the destruction of dioxins/furans)?	
Metals		
112	Is up-stream waste segregation performed (e.g. Hg at chemical waste incinerators)	
113	Is carbon injection carried out if Hg is a problem?	
114	Is efficient particulate abatement in place (relevant for the majority of metals)?	
Iodine and Bromine		
115	Is sodium thiosulphate added to the scrubber to reduce iodine and bromine to the respective halogen hydride? (in case wet scrubber systems are used)	
116	Is the resulting effluent stream subsequently treated?	
Further Items to be checked		
117	Accident management	
118	Efficient use of raw materials and water	
119	Energy efficiency, heat recovery	

Item Ref.	Inspection Item	Compliant (Yes; No or Not Applicable*)
120	Odour, noise and vibration	
121	Flue gas recirculation	
122	Dump stacks and bypasses	
123	Cooling system	
124	Boiler design	

* Where an item on the checklist is marked either NOT COMPLIANT or NOT APPLICABLE there must be either an ACTION or COMMENT completed in the table below. Where the item is not compliant then in addition an ACTION completion and therefore a compliance date must be added in the third column below.

Where the item is marked NOT APPLICABLE then there must be an explanation as to why that item is NOT APPLICABLE.

FOLLOW UP ACTIONS AND JUSTIFICATION COMMENT

Item Ref.	COMMENT/ACTION	Action Completion Date

Item Ref.	COMMENT/ACTION	Action Completion Date

CONCLUSION OF INSPECTION

Installation Representative Signature:		Date and Time:	

ISHMP Representative Signature:		Date and Time:	

Date of Agreed Follow Up Visit:	