EUROMOT

FAQ – Questions regarding the General & Thermal Power Plants EHS Guidelines

The Euromot Position

05 February 2010

EUROMOT

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ENGINES IN SOCIETY

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EUROMOT is the European Association of Internal Combustion Engine Manufacturers. It is committed to promoting the central role of the IC engine in modern society, reflects the importance of advanced technologies to sustain economic growth without endangering the global environment and communicates the assets of ICE power to regulators worldwide. For almost 20 years it has supported its members, consisting of national associations and companies from all over Europe and abroad, by providing expertise and up-to-date information and by campaigning on their behalf for internationally aligned legislation.

For further information about the Association, please visit our website:
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Status: 2010-01-01

BACKGROUND

In March 2007, IFC issued the final General EHS and in December 2008 Thermal Power Plants EHS Guidelines. In practice, these Guideline documents are today the "minimum environmental standards" in international power plant projects due to the "Equator Principle" (http://www.equator-principles.com/index.shtml) adapted by major international financial institutions.

In general, EUROMOT find the above mentioned Guidelines to be clear. However, some items need further explanation in order to be consistent and avoid confusions (which might result in project delays, end up in technical hurdles creating **unnecessary** excessive costs) in the implementation of these.

In previous discussions between EUROMOT and IFC, we have understood that you are planning to insert a "Frequently Asked Questions" document on the webpage of IFC. Below we have listed questions we feel are important and need further explanation (based on questions raised by sales people, external/internal design engineers, customers, different authority persons, etc.) in the implementation of the Guidelines. These clarifications are needed in order to make the Guidelines represent GIIP (Good International Industrial Practice) and BAT (Best Available Technique).

FAQ - FREQUENTLY ASKED QUESTIONS

1. *Question: What noise requirements apply to small combustion plants (3 - 50 MWth)?*

In General EHS Guidelines /1/ made for small combustion plants in range 3 – 50 MWth (fuel input) on page 66 (table 2.3.1.) for "*open offices, control rooms, service counters or similar"* the maximum equivalent (LAeq 8h) noise level is set to 45 – 50 dB(A). In the Power Plant EHS Guidelines /2/ made for bigger combustion plants > 50 MWth page 15 (footnote 29) is stated *"[..] This Guideline recommends 60 dBA as GIIP, with an understanding that up to 65 dBA can be accepted for reciprocating engine power plants if 60 dBA is economically difficult to achieve*". I.e. there is a huge discrepancy between the control room noise demand between the small plant and big plant! The noise levels given in the Thermal Power Plants document is in line with limits seen around the world, e.g. in western countries. In order to avoid inconsistencies we conclude that noise requirements for big plants exceeding 50 MWth for control rooms (60 - 65 dBA, Thermal Power EHS Guidelines /2/) can be applied also for a small combustion plant 3 - 50 MWth (General EHS Guidelines /1/). Is our interpretation correct?

2. *Question: What NOx limits apply to smaller Dual Fuel engines (3 – 50 MWth plant category) in liquid mode?*

In the Power Plants EHS Guidelines page 20 (table 6 (A)) the *Dual Fuel engine (DF) in liquid mode* has (in a "Non Degraded Area" or "NDA") an own technique specific NOx emission limit of *2000 mg/Nm^3 (15 % O_2).* In the General EHS Guidelines page 7 (table 1.1.2) no own technique specific NOx-emission limit is defined for a Dual fuel (DF) engine in liquid mode, only similar diesel engine NOx-limits as given in the Thermal Power Plants /2/ for a compression ignition (CI) engine are shown. It should be noted that DF and CI engine are different engine technique types and therefore the approach taken in the Thermal Power Plants Guidelines is logical. We conclude for consistency that for a smaller Dual Fuel (DF) engine power plant (3 - 50 MWth) ruled by the General EHS Guidelines /1/ the same NOx limits apply as given in the Thermal Power Guidelines (> 50 MWth) /2/ for a DF engine in liquid mode. Is our interpretation correct?

3. ***Question: What NOx limits apply to liquid fired reciprocating engine plants ≥ 300 MWth in Non Degraded Areas if sufficient amounts of good quality water are not available for NOx abatement?***

In the Power Plants EHS Guidelines in context with the set NOx limit for the big liquid fired plant (≥ 300 MWth in NDA ("Non Degraded Area")) is stated "*(contingent upon water availability for injection*)". The set NOx limit of 740 mg/Nm^3 (15 % O_2) is very low and can only be fulfilled with an "advanced water method" (still under development for the stationary plant) with a huge consumption of good quality water (e. g. for a 100 MWe plant 350000 tonnes/year clean water, see /4/ page 10) or by use of a SCR. Note also (page 17 /2/) "*[..] The potential effects of water use should be assessed [..] to ensure that the project does not compromise the availability of water for personal hygiene, agriculture, recreation and other community needs*". In context with SCR, a good infrastructure for reagent, spare parts, etc. shall exist (see /3/ page 360). SCR is not considered to be a universal BAT especially for plants with frequent starts, shut-downs and no BAT span was set for NOx in the document: *"[..] SCR is part of BAT but no specific emission levels are associated with BAT in a general sense"* (/3/ page 406). It should be noted that the sulphur content of the fuel sets a minimum (flue gas) temperature operation window for the SCR (in order to avoid clogging due to ammoniumbisulphite salt formation on the elements) which is not achievable for some engine types and for others very difficult to maintain in case of varying load conditions, SCR reactors also need to be equipped with tailor made sootblowing equipment (due to the ash content, etc. of the fuel). On page 407 (table 6.48), primary methods such as "Miller-type engine, injection retard" are listed as BAT besides SCR, but these primary methods cannot reach the low NOx level of 740 mg/Nm^3." EUROMOT concludes (in NDA = Non Degraded Area) therefore that in locations where sufficient amounts of good quality water is not available for NOx abatement for liquid fired reciprocating engine plants ≥ 300 MWth, same NOx-limit set for liquid fired reciprocating plants (50 – 300 MWth) in the Thermal Power Plants EHS Guidelines will apply in NDA for all plant sizes > 50 MWth, if the applicable air quality standard is in compliance. Is our interpretation correct?

4. ***Question: How is the rule that a single project should not contribute more than 25% of the applicable ambient air quality standards in an airshed applied correctly?***

On page 3 of the Thermal Power Plant EHS Guidelines it is stated that *"[..] emissions from a single project should not contribute more than 25 % of the applicable ambient air quality standards to allow future sustainable development in the same airshed*[5]". Footnote 5 shows the US EPA PSD (Prevention of Significant Deterioration) increment limits "*[..] SO_2 (91 µg/m^3 for 2nd highest 24-hour, 20 µg/m^3 for annual average), NO_2 (20 µg/m^3 for annual average), and PM10 (30 µg/m^3 for 2nd highest 24-hour, and 17 µg/m^3 for annual average).*"

A similar statement as above is made on page 19 /2/ but on same page footnote 34 following is stated: " *US EPA Prevention of Significant Deterioration Increments Limits applicable to non-degraded airsheds*". I.e. text on the page is pinpointing on fixed increment levels (case in US) besides the 25 % increment !

When comparing the set US PSD limits (for a Class II area) to the set US EPA primary NAAQS maximum ambient ground level concentration limits one can conclude that the US PSDs are typically in order of 25 % of the total maximum NAAQS limit. However, it should be noted that US EPA has set an absolute concentration figure and not percentage limits for the PSDs.
In different areas and countries around the world the set Ambient Air Quality Guidelines (AAQG) differ considerably e.g.

- EU /5/ SO_2 (24-hour) mean 125 microgam/m^3
- US /6/ SO_2 (24-hour) mean 365 microgam/m^3

- WHO /7/ SO_2 (24-hour) mean 20 microgam/m^3;

  i.e. by applying the universal "IFC factor" of 25 % on above 24-hour SO2 mean values, the maximum allowed air quality increment figure should then depending on air quality standard be:
- Based on EU value: abt. 31 micrograms/m3
- Based on WHO value: 5 micrograms/m3
- Based on US EPA value: abt. 91 micrograms/m3;

  I.e. in many cases the result should be much stricter than the intention of the original standard (e.g. **note**: **in the EU no universal individual plant increment limit is stipulated**) was and not even in the spirit of above document /2/. In order to safeguard a feasible & sustainable development **either** a 25 % impact of a single plant **or** fulfilment of the US primary (Class II) PSD factors should be the Guideline in order to reach a feasible balance between the environmental and cost aspects.

EUROMOT concludes that in order to get a balance between environmental and cost aspects with different ambient air quality standards around the world either the 25 % single project impact of the total ambient air quality limit **or** the US EPA primary NAAQS PSD concentration values should be used in a project. Is this conclusion correct?

5. ***Question: In the absence of nationally legislated air quality standards, can internationally recognized sources (e.g. US or EU) be applied instead of the current WHO Air Quality Guideline?***

On page 20 in /2/ below table 6(A) is stated: "*[..] Airshed should be considered as being degraded if nationally legislated air quality standards are exceeded or, in their absence, if WHO Air Quality Guidelines are exceeded significantly [..]*" .

On page 5 in document /1/ subheader 14 is stated: "*An airshed should be considered as having poor air quality if nationally legislated air quality standards or WHO Air Quality Guidelines are exceeded significantly*". **However**, on page 4 in /1/ is stated: "*Emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence the current WHO Air Quality Guideline or other internationally recognized sources [..]".* There seems to be a mismatch between these different statements; and possible WHO requirement (many ambient air quality limits of WHO are stricter compared to those in US and EU) will lead to big problems, especially in developing countries. We conclude that some text addition in documents /1/ and /2/ are needed in order to make clear that in absence of national air quality standards the current WHO Air Quality Guideline **or** other internationally recognized sources should be applied. Correct ?

6. ***Question: How are power plants equipped with "spare engines" to increase availability/reliability treated if they exceed the 300 MWth threshold due to the extra installed engines?***

In the Thermal Power plant standard liquid fired stationary engines plant sizes ≥ 300 MWth ("*with a total rated heat input capacity [..] on higher heating value basis*") have stricter emission limits than smaller plant sizes. In some power plants around the world the installed engine capacity is however bigger than the calculated output electricity capacity of the plant should need. This might be due to availability/reliability tender requirements and if one or more "spare" engines are needed in case of scheduled service intervals or sudden engine breakdowns. For power plants designed for a maximum capacity of electricity generation with a fuel input of e.g. 300 MWth but equipped with such “spare engines” an additional clarification is needed in order to avoid confusion or wrong interpretations and as a consequence unnecessary high costs which might result due to different interpretations of the Guidelines by various consultants, etc.

In order to class a power plant with “spare engines” to belong to the < 300 MWth category we propose following (clarification needed to Guidelines /2/):

An automation based calculation system which limits the plant electrical output to match the < 300 MWth fuel input limit. The calculation would derive the fuel input based on electrical output (in case of no additional boiler fuel usage for steam, etc, production), fuel energy value and ISO 3046 engine derating and efficiency rules. Alternatively the fuel flow based limitation can be used, which limits the plant output based on fuel flow and fuel energy values. Is this interpretation text OK?

7. ***Question: How should the rules regarding the requirement to use continuous ambient air quality monitoring systems be applied?***

In the Thermal Power Plants Guidelines page 23 is defined: “*If incremental impacts predicted by EA $\geq$ 25 % relevant short-term ambient air quality standards or [..] Monitor parameters (e.g. PM10/PM2.5/SO_2/NOx [..]) by continuous ambient air quality monitoring system [..]”* resulting in high costs (/4/ page 15). Furthermore, compared to praxis in Europe this is a very strict approach, e.g.:

- EU: If the “upper assessment thresholds” for the ambient ground level limits (typically 60 - 80 % of max. value depending on pollutant and limit value: annual, 1/24 hours) are exceeded then CEMS is demanded /4/ page 15.
- Jamaica has a similar approach as EU.

According to a UK document (see /4/ page 16) *“[..] Detailed assessment of short-term effects is often complex [..] The error in estimating short-term releases can be a factor of 4 to 5*”.

Ambient air quality standard maximum levels vary greatly around the world therefore the 25 % rule in combination with the short term modelling uncertainties will lead to exaggerated procedures stricter than asked for in many western countries.

We conclude that in order to get a balance between environmental and cost aspects with different ambient air quality standards around the world: that if a single project exceeds the US EPA primary NAAQS PSD values (for a Class II area) **or if EU “upper** assessment **thresholds” are exceeded** or if the used national or international ambient air quality standard asks for CEMS after an exceeded concentration threshold level then continuous measurement of Ambient Air Quality should be asked for. Is interpretation correct ?

8. ***Comments regarding the table 1.3.1 “Indicative Values for Treated Sanitary Sewage Discharges” of the General EHS Guidelines:***

   Can a small/medium size plant follow as an alternative an European approach regarding the sanitary waste water treatment discharge limits in order to keep the technique to be used on a reasonable and cost-effective level ?

In many places, the text of the EHS Guidelines refers to table 1.3.1 of the General EHS Guidelines (page 29) and this table is used as a requirement for treated sanitary sewage discharges due to absense of local regulations. We would like to bring to your attention that this level of purification is connected to relatively high cost and is also complicated to apply to small/medium plants especially due to nitrogen levels. For comparison, in Finland this low level is applied only to plants treating more than 100.000 population equivalent sanitary waters (Government Decree on Urban Waste Water Treatment 888/2006 Issued in Helsinki 12 October 2006). For less than 2000 population equivalent treatment plants there is no nitrogen limit.

EUROMOT believes this low nitrogen limit should **not** be applied to small/medium sized plants as this would necessitate additional investment just to meet one parameter.

9. Could the lower heat value (LHV) of the fuel be used in place of the higher heat value (HHV) ?

In Europe LHV is used and this is also the case in many international standards. E.g. ISO 3046-1:2002(E) standard "*Standard reference conditions and declarations of power, fuel consumption and lubrication oil consumption*" for reciprocating engines is based on the use of LHV. See e.g. paragraph 13.2. The EU definition for a big thermal plant threshold of 50 MWth is also based on the LHV of the used fuel. The new IFC definition for a big thermal plant seems to be based on the "European approach" thus it would appear to be more consistent to use LHV of the fuel and not HHV. EUROMOT members have found that the IFC approach is creating confusion amongst customers familiar with the ISO 3046- I standard and thus a lot of extra work of calculations and explanations are needed. EUROMOT therefore recommends using LHV in place of HHV of the fuel,

10. Comment: Table 1.1.2 of General EHS Guidelines need further clarification

Table 1.1.2 on pages 14 – 15 in the General EHS Guidelines describes amongst all reduction efficiencies by different secondary abatement techniques. However, in the table text it is not clearly defined that given figures apply to boiler installations and not to stationary engine plants (having a different exhaust composition of the particles, etc. compared to a boiler plant). Some readers might have difficulties to understand that not all prime mover techniques will reach the same efficiencies with the listed secondary abatement techniques. Further explanation is therefore needed. In our opinion, the words "for a boiler plant" need to be added to the header of the table on page 14 in order to achieve greater clarity. Would this be possible?

11. Comments regarding engine definitions

Furthermore, we believe following amendments to the text of the Thermal Power Plants EHS Guidelines would help to clarify.

On page 27 we suggest adding:

"Internal combustion engines convert the chemical energy of fuels (typically diesel fuel or heavy fuel oil) into mechanical energy in a design similar to a truck/marine derived engine (dependent on engine size), and the mechanical energy is used to turn a generator. Two types of engines normally used: the medium-speed, four-stroke trunk piston engine and the low-speed, two-stroke crosshead engine. Both types of engine operate on the air-standard diesel thermodynamic cycle. ***Diesel Process:*** *Air is drawn or forced into a cylinder and is compressed by a piston. Fuel is injected into the cylinder and is ignited by the heat of the compression of the air. The burning mixture of fuel and air expands, pushing the piston. The products of combustion are then removed from the cylinder, completing the cycle.*

Please add on page 28:

"Diesel engines are fuel flexible and can use fuels such as diesel oil, heavy fuel oil, natural gas, crude oil, bio-fuels (such as palm oil, etc.) and emulsified fuels (such as Orimulsion, etc.).Addition (after " (such as Orimulsion, etc.). ***Liquid fuel (as pilot fuel) is often used for ignition in case gaseous fuel is the main fuel. Some diesel engines can operate on gaseous fuel as well as diesel fuel at full load conditions"***

Also on page 28, some suggested amendments regarding the definition on spark Ignition (SG) engines:

"Often a spark ignited gas-otto enginetype works according to the lean burn concept meaning that a ~~lean mixture of combustion air and fuel is used in the cylinder~~ **lean mixture of combustion air and fuel is drawn or forced into the cylinder** *(e.g., much more air than needed for the combustion)."*

"The ~~ignition is initiated with a spark plug or some other device located in the prechamber~~ ***ignition is initiated with a spark plug, or some other device****, resulting in a high-energy ignition source for the main fuel charge in the cylinder."*

Some suggestions regarding the definition of Dual Fuel engines, also page 28:

"~~Some DF engine types are fuel versatile~~ ***Lean burn type Dual Fuel (DF) engines are fuel versatile*** *these can be run on low pressure natural gas or liquid fuels such as diesel oil (as back-up fuel, etc.), heavy fuel oil, etc. This engine type can often operate at full load in both fuel modes. Dual fuel type engines can also be designed to work in gas mode only with a pilot liquid fuel used for ignition of the gas.~~Dual Fuel (DF) engines can also be designed to work in gas mode only with a pilot liquid fuel used for ignition of the gas.~~* ***At operation on gaseous fuel a lean mixture of combustion air and fuel is drawn or forced into the cylinder (lean burn concept) and the ignition is initiated with a small amount of liquid fuel."***

Furthermore, EUROMOT suggests adding definitions for Gas Diesel and Lean Burn engines:
"Gas Diesel (Compression Ignition engine in gas mode)": "Air is drawn or forced into the cylinder separately from the fuel"

"Lean Burn": "A lean mixture of combustion air and fuel is drawn or forced into the cylinder"

Vaasa / Frankfurt/M., 2010-02-05

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SOURCES

/1/ General EHS Guidelines 2007 at http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/gui_EHSGuidelines2007_GeneralEHS/$FILE/Final+-+General+EHS+Guidelines.pdf

/2/ Thermal Power Plants EHS Guidelines 2008 at http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/gui_EHSGuidelines2007_ThermalPower/$FILE/FINAL_Thermal+Power.pdf

/3/ EU LCP BREF at http://ftp.jrc.es/eippcb/doc/lcp_bref_0706.pdf

/4/ Euromot Position Paper: " EHS Guidelines for Thermal Power Plants" dated May 2008 at http://www.euromot.org/alfresco/d/d/workspace/SpacesStore/697a2bd0-ac98-41bf-ac08-8a27f64f18ed/WB%20Thermal%20Power%20Plants%20guidelines%202009%2005.pdf

/5/ EU Directive "Ambient air Quality and Cleaner air for Europe" 2008/50/EC at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:EN:PDF

/6/ US EPA Primary NAAQS at http://www.epa.gov/air/criteria.html

/7/ WHO Air Quality Guidelines for particulatematter, ozone, nitrogen dioxide and sulphur oxide Global update 2005 at http://whqlibdoc.who.int/hq/2006/WHO_SDE_PHE_OEH_06.02_eng.pdf