

# Waste Gas End-of-Pipe Treatment Techniques in Italian IPPC Chemical Plants

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## INTRODUCTION

Due to more stringent emission regulations, very efficient new advanced emission control technologies are required adopting National IPPC (Integrated Pollution Prevent and Control) Permits (below AIA) based on Best Available Technologies (below BAT) Conclusions.

Some of these techniques are operating inside Chemical Plants and Refineries based in Italy, such as Oxidation, Adsorption and Absorption devices. Other techniques (i.e. the ones that are new advanced technologies still in research or in demonstration state), are not subject of this Paper, based on describing running situation inside operating IPPC Chemical Plants and Refineries licensed in Italy at National Level.

This paper includes, but are not limited to, the results of a screening of Italian Chemical IPPC Industries and Refineries up to day, trying

to highlight operating conditions and possible already existing improvements for removal of:

- VOC and other cancer causing and toxic substances;
- Dust, Mercury and heavy metals;
- NO<sub>x</sub> and Nitrogen compounds;
- SO<sub>x</sub> and Sulphur compounds;
- Chlorides and Fluoride compounds.

The abatement techniques analyzed in this work operate mainly on VOC content reduction, through the use of Oxidizing devices or on inorganic compounds abatement (in addition to VOC), through the use of Absorption or Adsorption devices.

Superior Environmental Protection and Research Institute (below ISPRA) experience, mainly developed as Technical Support to Italian Minister of Environment, Land and Sea (below IMELS),

has allowed to analyze different operative conditions, related with abatement techniques and their application in IPPC permitted plants.

Many pollutants emitted from IPPC plants (according to Environmental Permits limit values) have been identified and charted a profile of possible application for abatement techniques in these plants in their different IPPC categories.

The results of this analysis allow to suggest a possible reconsideration and, also, new assessment for some end-of-pipe devices, in order to find other better defined operational contexts, different from actually Italian provisions and, also, an evaluation of current operational performances of the devices, in order to improve their environmental conditions, consistently with BAT application.

## BACKGROUND

In Italy, IPPC Permit is an authorization released for environmental protection purposes, in order to prevent and control pollution ‘at the source’ by means of an integrated authorization, allowing operation of IPPC industrial activities with specified production’s characteristics and dimensions, at both national and regional levels (Battistella, 2013).

The list of the categories of these specific industrial activities is regulated by the Italian Legislative Decree n. 59/2005 and s.m.i. (Italian Legislative Decree n. 152/2006 and s.m.i.) that adopts and endorses the Directive n. 96/61/EC and s.m.i. (Directive 2008/1/EC and s.m.i.) concerning integrated pollution prevention and control (actually recast in the Directive 2010/75/EU).

IPPC permits – by law definition - plan and perform an integrated prevention and control set in the exact point of pollution (‘a la source’), e.g. pollutants are identified, declared, controlled, detected and monitored in the admission/emission points of the IPPC industrial activities, as well as during all activities of industrial plants’ operation (Battistella & Di Marco, 2013a; Battistella & Di Marco, 2013b).

This means authorization of plants’ operation controlling natural resources’ usage, as well as emissions and discharges in the environment inside predefined limit values with prescriptions, adoption of predefined monitoring framework, as self-controls on selected parameters, frequencies and methodologies, with a periodic reporting and planned inspections based on the effective environmental risk (Battistella & Di Marco, 2013a; Battistella & Di Marco, 2013b).

In Italy, AIAs are released by the Competent Authority, as

- By IMELS for national strategic plants;
- By other Authority designed by Region or autonomous Province for others.

In order to accomplish IPPC permits operative performances in terms of assigned limit values, among other provisions, also waste gas end-of-pipe treatment devices are adopted - as well as installed and operated - in order to abate or at least decrease pollutants’ contents (even often dangerous substances and compounds) in *waste-gases* before their emission into open air.

Adopted techniques must be considered equal to, or committed to become under IPPC permits period of duration (more or less 10 years), as Best Available Techniques and their operating performances are described in details into *Reference Documents on Best Available Techniques (BRefs<sup>1</sup>)*.

## BAT CONCLUSIONS APPLICATION IN ITALIAN IPPC PERMITTED PLANTS

### The Italian National Environmental Regulatory Framework for IPPC Installations

As regards to Italian Regulations, Attachment X to Part II of Legislative Decree n. 152/06 <sup>[9]</sup> defines the list of main pollutants to be monitored,

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