Atmospheric Impact Assessment

Armand ALBERGEL – aalbergel@aria.fr
ARIA Technologies SA
8-10, rue de la Ferme – 92100 Boulogne Billancourt – France
Telephone: +33 (0)1 46 08 68 60 – Fax: +33 (0)1 41 41 93 17
E-mail: info@aria.fr – http://www.aria.fr
ARIA Technologies

ARIA Technologies was founded in 1990 by a group of researchers from the R&D department of EDF, the French electricity board.

It is now an independent company, leader in its field in Europe. Its headquarters are located near Paris, with offices in France and a sister company, ARIANET, in Milan, Italy.
One focus: modeling the atmospheric environment

- from building scale to continental scale
- from simple screening models to full-blown CFD solutions
- keeping consulting, software, systems and training tightly linked
- with an international and open approach, close to top R&D centres.
Application domains

Industry
- Environmental Impact Assessment
- Risk Assessment
- On-site supervision systems
- Renewable Energies

Public sector
- Regional and Urban scale air quality modelling and forecast systems
- Scenarios and planning (emission reductions)

Defence
- NRBC Agent dispersion Modelling
- Anti-terrorism decision support systems
Since 1998, ARIA Technologies has taken part in over one hundred air pollution dispersion studies related to industrial sites Power plants, incinerators, Waste Treatment facilities.

- Air quality and ground deposition
- Odors
- Health Risk Assessment.
Environmental Impact Assessment

3D meteorological fields.

Site

Validation vs. experimental data ➔ 3 different models
Environmental Impact Assessment

Health Risk Assessment

- Identification of dangers:
  - chronic toxicity
  - carcinogenic risk
- Dose-response relationship analysis:
  - threshold toxicants known as "systemic toxics"
  - non-threshold toxicants such as carcinogenic pollutants
- Calculation of exposure:
  - inhalation
  - ingestion
- Assessment of health risk:
  - Threshold toxicants: danger ratio
  - Non-threshold toxicants: probability of developing a cancer
Environmental Impact Assessment

Odors

Odors & VOC on line emissions monitoring
Electronic noses analyzers constellation

RQ BOX constellation
Data access on central monitoring center
On-site modelling system: ARIA View®

Meteorological data (site station - forecast)

Maps of results (Web compatible)
- Concentrations, depositions
- Odours
- Tracking critical points
- Backwards trajectories

Emission data, computed / measured

Data collection, model runs

Industry: ROMPETROL (Romania)

- Manage exposure and risk
- Broadcast results
- Evaluate health risks

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Regulatory constraints

- **Collective air pollution control in an industrial basin**
  - Share the responsibility and the investments on air concentration bases and not only on total year emissions
  - Ambient air monitoring networks are generally not enough dense to cover the whole area

- **Individual air control for some industries**
  - Example of a domestic waste incinerator: Monitoring the impact in the vicinity of the installation (Art 30 et 31 of the law 20 September 2002 concerning burning installation of hazardous and non-hazardous waste):
    - *Initial diagnostic*: before the installation opening
    - *Between 3 and 6 months*: after the installation running
    - *Routine update*: at least annually

Reference: INERIS (mandated by the French MOE) «Methode de surveillance des retombées des dioxines et furanes autour d’une UIOM» 2001
Need of an on-line Supervision tool

- A global tool to:
  - Optimize the atmospheric environment supervision
  - Improve internal and external communication (HQ and quick adaptability): neighborhood, Local authorities, routine reporting, nongovernmental association...
  - Analyze, understand and explain the impact of their own releases

- How?
  - On-line concentration and deposition of main pollutants (NO₂, dioxines, heavy metals...) considering real emissions and actual meteorological data
    - Comprehensive Maps
    - Help to design measurement campaign
    - Ready to run in case of accidental / exceptional releases

⇒ A detailed knowledge of the impact of their own installations
Need of an on-line Supervision tool

- Editing results every 3 hours:
  - concentration and deposition maps
  - summary table of values
- Continuous update of computational values on key points:
  - daily,
  - Monthly
  - Annually (main statistics as centils)
- Time series of meteorological data and emission
- Data base backup for all data and results (Yearly base)
- Detailed run on request (peak, accidental or exceptional release)
- Optimization (measurement, day-to-day reporting,...) of the supervision
Where are the difficulties?

- **Numerical geographical data → OK**
  - Topography and land use largely available worldwide now and especially in Europe
  - GIS are widely used

- **Meteorological data → OK**
  - Better sensors and denser network
  - Numerical forecast and analyses better quality
  - Progress on Meso-scale modeling

- **Emissions → OK?**
  - Better understanding using ‘universal’ classification like SNAP and emission factors
  - Self-monitoring emission CEMS or PEMS

- **Computational and numerical network → OK**
  - Power increased on low cost computer
  - Internet / intranet / ADSL communication

- **Numerical techniques become central**
General flowchart

**Meteo data**
Wind, temperature, rain

**Database consolidation**
Automatic impact model run

**Results**
- Air Concentration data
  - Maximum: Localization and values
  - Editing values on a list of key points
- Monthly and annual synthesis
- Maps of concentrations et deposition (dry and with rain)
- Detailed peak episode on request
- Automatic and exhaustive data backup and archives

**Site**

**Emission monitoring**
Specific analyses as heavy metals and dioxins...
Sampling program

Self control continuous measurements:
HCl, CO, CO2, SO2, NOx, COT, NH3, H2O, O2, N2O, flowrate and temperature

Data acquisition system and Automatic report editing

Nota: "HCL C---L1" threshold is instantaneous threshold express in duration. "SO2 C--L1" and "HCL C--L2" threshold are calculated threshold expressin duration. Others are instantaneous thresholds express in number.
Thiverval-Grignon Incinerator Plant (France)

Stack seen from the roof

Site features:

- Isolated plant
- Gently rolling terrain
- Single stack
- CEMS system in place (ESA)
- Dedicated meteorological station

Site surroundings
Thiverval-Grignon Incinerator plant (France)

ARIA View: instantaneous plume every 30 minutes
Thiverval-Grignon Incinerator Plant (France)
ARIA View: monthly averaged ground impact
Site features:

- Large petro-chemical platform on the Black Sea shore (Constantza)
- CEMS in place (ENVIRONNEMENT SA)
- Dedicated meteorological station
ROMPETROL Refinery (Romania)
ROMPETROL Refinery (Romania)

CO Iso 1 and 10 mcg/m³

03/09/2006 at 00:30:0.00
What next: real time for local scale

MSS: Urban Dispersion with obstacles

MSS Urban Dispersion Simulation

04:00:00.00
Questions ?

Now

or

aalbergel@aria.fr