ENVIRONMENT
INDUSTRIAL HAZARD ASSESSMENT

FLUIDYN-TRANSOFT, a group established in France in 1987, has been offering coupled Multiphysics modeling software for process optimization, for environmental impact and for industrial hazards assessment. **FLUIDYN -MP** is extensively used in industry**,** especially for transient problems requiring coupled simulation of fluids & structures. For environmental and risk analysis, **FLUIDYN -PANACHE, FLUIDYN -FLOWSOL & FLUIDYN -VENTIL** cover the topics of pollutants dispersion indoors and outdoors, water dispersion as well as fires & explosion with effect on structures. **FLUIDYN -REALTI**, is a 3D platform to model leak and odour dispersion in real time. Two most recent innovations are **FLUIDYN -SENSORMAP** dedicated to atmospheric emissions monitoring by inverse modelling of sensor data and **FLUIDYN -BFC,** numerical platform dedicated to battery and fuel cell modelling.

FLUIDYN software can be used for Quantitative Risk assessment (QRA) or pollution impact assessment (EIA) using dedicated solvers for atmospheric flows, for dispersion of dense gas or aerosols including radioactivity, for ventilation, for fire & explosion and their effect on structures, for pollutant dispersion in water and noise.

FLUIDYN also provides consultancy services on complex cases in industrial risk and process modelling to support process managers, health and safety managers, designers and construction engineers for environmentally sensitive sites, rail and road infrastructures, architects of hospitals and large public buildings, pipelines, harbours, defence, marine and nuclear installations.

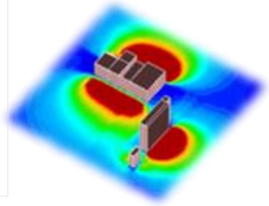
APPLICATIONS

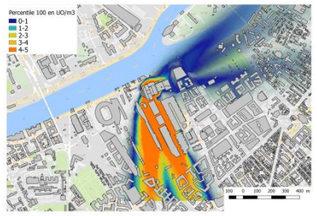
Industrial risks, emergency planning and response

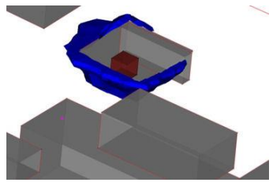
- Quantitative risk assessment (QRA) and process safety
- Atmospheric dispersion of toxic gas and particles (EIA)
- Fires and heat radiation
- Contaminant dispersion in confined spaces
- Tank burst and overtopping.
- Radioactive products dispersion in air and in water
- Gas cloud / aerosol / dust explosion
- Real time emergency management
- Surface and ground water pollution
- Sensor mapping for fast detection

Environmental impact

- Indoor / outdoor air quality
- Chronic health impact of pollutants
- Odor impact
- Air quality-health projects

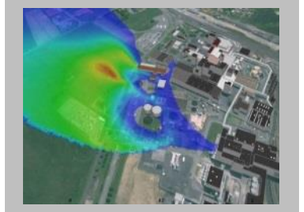


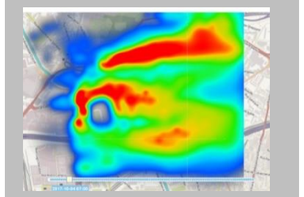




REFERENCES

Petrochemicals: ALKION, BP, BV, ENGIE, HPCL, JACOBS, L&T, ONGC, RELIANCE, SINOPEC, TECHNIPFMC, TOTAL, TRAPIL
Chemical and Agroindustry: AJINOMOTO, AIR LIQUIDE, AIR PRODUCTS, BASF, BAYER, CRISTAL UNION, INEOS, KPCL, McCAIN, MITSUBISHI, SANOFI, SOLVAY, SUMITOMO, SYCTOM
Process: ARCELOR-MITTAL, JINDAL, LAFARGEHOLCIM, MICHELIN, NIPPON STEEL, RIO TINTO, SITA, THYSSENKRUPP, VEOLIA, VINCI
Nuclear: ANDRA, BARC, BRITISH NUCLEAR, CEA, China NSC, CIRP, CNNC, EDF, FRAMATOME, IGCAR, ILL, L&T, ITER Organization, ITER India, JAEA, NPCIL, ORANO, ROLLS-ROYCE, SNERDI, TRACTEBEL
Automobile-Defense-Aerospace: AIRCELLE, BOSCH, CRYOSTAR, DGA, DRDO, DRDL, EADS, GABRIEL, HAL, INDIAN RAILWAYS, NAVAL GROUP, RDSO, ISRO, RATP, RENAULT, SHAR, SNCF, STBFT, TVS Motors, VSSC, ZODIAC
Academic and city councils: Berkeley, Beijing Institute of Technology, Centrale Supélec, Ecole Centrale Nantes, ENSMA, ESAIP, University of Evry, IIT India, KPCB, NIT India, INSA, University of Nottingham, SIAAP, Paris city, University of Saint-Quentin, University of Marne-la-Vallée





CONSULTANCY

REAL TIME MODELLING

CLIMATE IMPACT

MODELING TOOLS

3D SIMULATIONS

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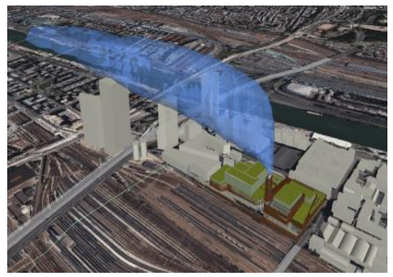
SERVICES AND MODELLING TOOLS FOR INDUSTRIAL RISKS AND ENVIRONMENT

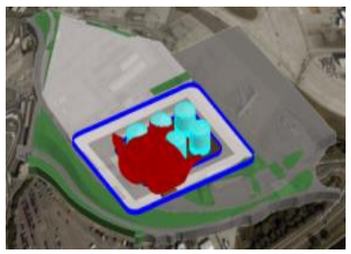
ACCIDENTAL RELEASE AND ATMOSPHERIC DISPERSION — *fluidyn*-PANEPR



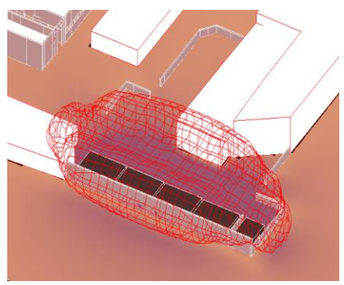
- Gas (light, dense and liquefied), particle, and aerosol dispersion
- Real time leak source detection, prediction of cloud motion
- Transient evolution of toxic / explosive clouds
- Radioactive particle decay, progeny dispersion
- Smoke dispersion from fires, pool fires, exhaust, stacks…
- Pipe / tank rupture: gas, liquid, or two-phase flows
- Pool evaporation, cooling tower plume visibility
- 3D CFD modelling on complex terrain.
- Inverse model / source localisation
- Dose calculation of toxic gases

fluidyn-PANWAVE — TANK FAILURE

- Rupture scenarios: Zip, complete, triangular, horizontal, shell based…
- Pipeline rupture near storage tanks
- Complex terrains with multiple tanks, merlons, retention bunds, walls, reservoirs…
- Spillage and pool spread estimate on site.
- Overpressure estimates of retentions and structures.
- Design of walls and retention bunds
- Design of mitigation solutions



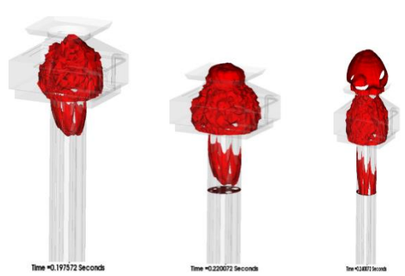
HEAT RADIATION AND FIRE PROPAGATION — *fluidyn*-VENTFIRE / PANFIRE



- Solid fires: wood, paper, plastic…
- Liquid pool fires: hydrocarbons, alcohol…
- Warehouse fires: logistics, agrifood, chemical products…
- Flame height and emissive power calculation
- Radiator model for solid flames and 3D view factors for affected areas
- Firewalls and radiation obstacles considered.
- Smoke movement and visibility
- Mitigation measures: merlons, firewalls, stock organization…

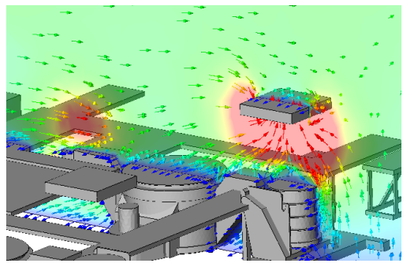
fluidyn-VENTEX — EXPLOSIONS

- Explosion of gas, dust, and solid explosives
- Deflagration and detonation (turbulence, closed spaces)
- Explosion models: BML, JWL, Arrhenius, EDC…
- 3D propagation of pressure wave fronts on complex terrain
- Structural resistance to explosion blasts
- Walls and vents design, areas of overpressure effects
- Simplified models: multi-energy methodology, TNT model

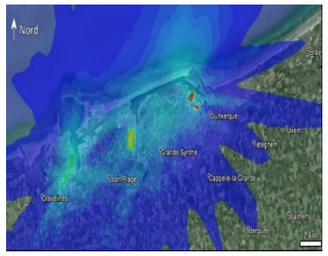


AIRFLOW AND POLLUTANTS IN BUILDINGS — *fluidyn*-VENTCLIM

- Public buildings/industrial complexes
- Air flow modelling in closed spaces
- Ventilation studies and extraction in emergency situations
- HVAC (ventilation, temperatures, pollutants)
- Accidental dispersion of airborne contaminants
- Particles, gas, radioisotopes, smoke
- Internal air quality and thermal comfort
- Optimization of ventilation and installation of air purification systems
- Air-conditioning network / barriers – pollutants, pathogens
- Influence of indoor vegetation, sun, building shadows



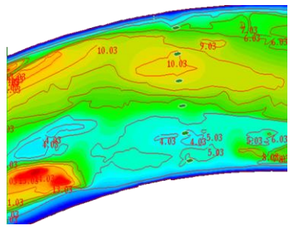
fluidyn-PANEIA — DISPERSION OF INDUSTRIAL EMISSIONS



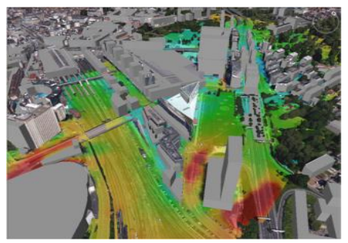
- Impact studies of atmospheric emissions, gas, particles, droplets
- Pipe or diffused emissions, surface, roof, door, and storage vents
- Impact assessment for any period – annual, seasonal, daily, etc.
- Low or no wind flow situation, wind rose
- Sensor mapping of air quality around industrial sites
- Odor impact, legionella, heavy metals, combustion gases
- Comparison with statutory thresholds
- Health impact analysis, impact mitigation, process optimization
- Inverse models for source apportionment

SURFACE AND GROUND WATER POLLUTION — *fluidyn*-FLOWSOL

- Transport and diffusion of liquid effluents (miscible and non-miscible)
- 2D/3D surface water hydraulics (rivers, estuaries, coastal waters)
- Erosion, deposition and dispersion of sediments and particles
- Oil slick drift and ground water contamination by radioactive waste
- Study of heat plume, river hydraulics, canal systems
- Monitoring hydrographic network for floods
- Structural resistance of dams, bridges, dikes…



fluidyn-PANROAD — ROAD TRAFFIC IMPACT ON AIR QUALITY



- Impact studies of transport infrastructures, health impact
- 3D dispersion on complex terrains (topo
- Wind rose, acoustic barrier impact on air quality near roads.
- Pollutant concentration in air and ground deposition
- Gas (NO_x, C_6H_6, SO_x...) and particles (PM_{10}, Pb, Ni, Cd ...)
- Comparison with statutory thresholds
- Air flow study for pedestrian comfort