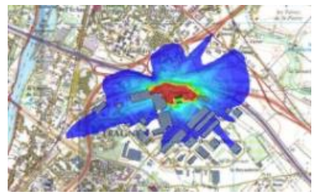
ANALYSIS AND 3D CFD MODELLING FOR ENVIRONMENTAL IMPACT & INDUSTRIAL RISKS

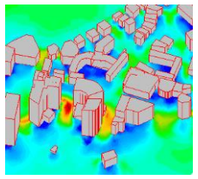
fluidyn –PANACHE — ATMOSPHERIC AIR FLOW & POLLUTANTS DISPERSION

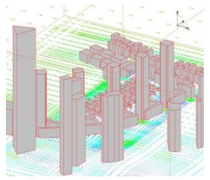
Software family for modelling airflow and pollutants dispersion in urban and industrial areas at local micro and urban scale



- Airflow, wind pressure at street level on building facades
- Consequences of Chemical, Biological, Radiological, Nuclear (CBRN) agents leak
- Quantitative Risk Assessment (QRA) of petrochemical products leaks
- Environmental Impact Assessment of industrial emissions, odours
- Roads, airports pollution impact on sensitive population- hospitals, schools
- Urban air quality forecasting from curb side to large cities
- Real time forecasting of industrial emissions, odours, traffic pollution impact
- Wind energy forecasting for a site before installation and in function
- Heat radiation from warehouse, fuel fires in 3D with effect of fire walls, sprinklers
- Modelling features: large / small scale dispersion, complex 3D topography, building / obstacles effects
- Models atmospheric / mechanical turbulence around obstacles, transient / chronic dispersion
- User friendly interface for numerical model construction, meshing and result analysis

AIRFLOW, PRESSURE & VELOCITY ON BUILDING FACADES — *fluidyn*-PANWIND

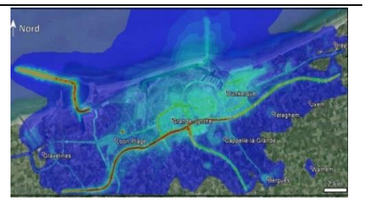




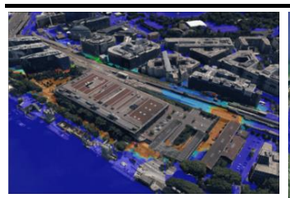
- Wind pressure and velocity on building facades
- Air intake and exhaust flow from industrial units
- Effect of sun, indoor vegetation, shadow of buildings
- 3D Wind flow generation for all wind rose conditions on complex terrain (hilly, high rise buildings..)

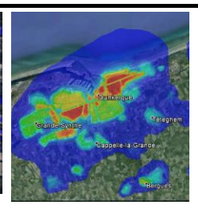
fluidyn-PANAIR — URBAN AIR QUALITY

- Impact studies for transport infrastructures (roads, highways network...)
- Dispersion of gas (NO_x, C_6H_6, SO_x...) and particles (PM_{10}, Pb, Ni, Cd ...)
- Pollutant concentration in air and on upper floors of buildings
- Sensitive population- hospitals, schools- exposure to pollution
- Low or no wind flow condition impact assessment
- Small-scale (<100 m) dispersion and impact mitigation
- 3 days forecasting & source management for impact minimisation



INDUSTRIAL EMISSIONS IMPACT ASSESSMENT — *fluidyn*-PANEIA

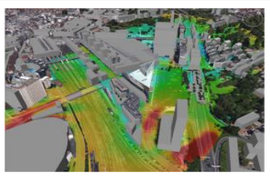




- Impact studies of atmospheric pollutants: gas, aerosol, odour
- Regulatory assessment & layout improvement of industrial sites
- Stacks, quarries, mines, sewage facilities,
- Piped or diffused emissions, surface, roof, door and storage vents
- Impact assessment for any period- annual, seasonal, daily etc..
- Low or no wind flow condition impact assessment
- Inverse models for source apportionment

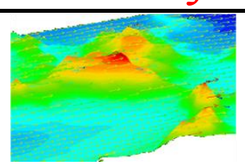
fluidyn-PANROAD — ROAD TRAFFIC IMPACT ON AIR QUALITY

- Impact of changes in the layout of roads (deviations, crossroads)
- Modifications in existing roads (lanes, traffic lights, u-turns, crossings)
- Impact of acoustic barriers (prediction aspect)
- Pollution values just outside urban road tunnels
- Traffic pollution evaluation of gaseous pollutants (NOX, CO, HC…) or particulate matter (PM10, Pb, etc.) for a standard fleet of vehicles

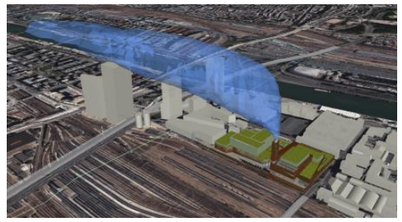


WIND ENERGY POTENTIAL ASSESSMENT — *fluidyn*-PANEOLE

- Wind flow assessment on sites far from weather masts
- Turbines wake and positioning
- Energy production forecasting for existing sites



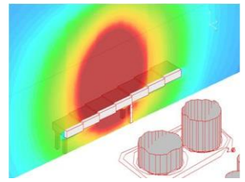
fluidyn-PANEPR — TOXIC/FLAMMABLE GAS OR AEROSOL DISPERSION

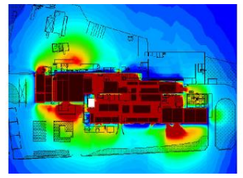


- Dispersion of gas, particles and aerosols
- Light, dense and liquefied gases
- Real time leak source detection prediction of cloud motion
- Fire and combustion-gas & smoke particles,
- Radioactive particulate decay and progeny dispersion
- Pipe/tank rupture: gas, liquid or two-phase flows
- Pool evaporation, cooling tower plume visibility
- 3D airflow over terrain and obstacles with fluid dynamics
- Lagrangian and puff models for particles, aerosols
- Dose calculations of toxic gases
- Simple cases identification by empirical screening

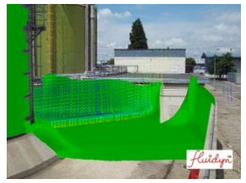
FIRE RADIATION FROM STANDING FIRES — *fluidyn*-PANFIRE

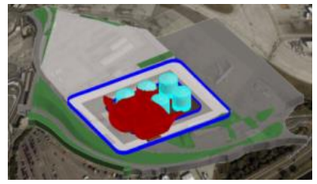
- 3D radiation model from maximum flame heights
- Flame height & radiation calculation with 3D view factors
- 3D hilly terrain with obstacles
- Pool fires data base for CH products
- Solid material fires: organic compounds, wood & plastics
- Material library with more than 400 solids, liquids
- Effect of airflow & sprinklers on flame height & radiation





fluidyn-PANWAVE — CATASTROPHIC FAILURE OF TANK STORAGE

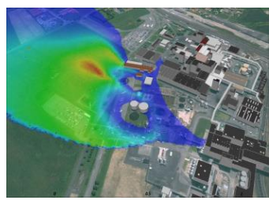




- Complete, zip or shell base / rupture
- Partial opening: vertical, horizontal, triangular
- Pipe rupture near storage tanks
- Complex terrain with buildings and obstacles
- Modified VOF method for free surface flow
- Overpressure estimate for bunds and structures
- Retention bunds and walls design
- Spillage in the retention area by jet leak
- Spillage on the site (pool extension) and mitigation measures

SENSOR MAPPING & SOURCE DETECTION — *fluidyn*-REALTI

- Optimization of spatial positions of sensors for quick real time detection of leak sources
- Real time alert of the consequences of toxic or flammable gas/ aerosol spread
- Source identification from sensor data and inverse modelling
- Results from real-time can be used for consequence assessments



fluidyn-ASSESSRISK — PETROCHEMICAL RISK ANALYSIS

- Risk/ preliminary analysis with empirical/analytical methods
- 13 critical equipments, 45 accidental scenarios, more than 300 different products (hydrocarbons)
- Analytical methods for blast jet fire, pool fire
- BOILOVER (full and shallow), UVCE (multi-energy method or 3D), BLEVE (TRC Shell model)
- Damage circles, values at targets, kinetics & domino models