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Reputation Resources Results

INDUSTRIAL TECHNOTES

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REAL-TIME FORECASTING AND DISPERSION MODELLING

By Sarah Arulanandam, Ian Dowsett and Mervyn Davies
Risk Management & Assessment Group, RWDI Air Inc.

In the event of a chemical release to the atmosphere, whether planned or accidental, the ability to visualize the magnitude and extent of the chemical plume is critical. The advancement of technology in areas of meteorological forecasting, satellite communication, dispersion modelling, plume animation, and data storage, coupled with the rapid deployment of monitoring equipment, can now provide this understanding.

A BRIEF OVERVIEW

RWDI has developed a real-time dispersion model system that integrates available, proven technologies to predict current and future air-quality changes using real-time meteorological data. The model predictions provide an understanding of expected air quality changes in real time. These predictions can help decision-makers manage and mitigate risks associated with planned and accidental release events. The model can be accessed through a secure internet connection.

For planned release events, such as well test flaring, it is often difficult to find 'a time window' for completing an extended well test, especially for high-release rate wells located in complex terrain areas. The current "STOP/GO" approach requires the termination of the test if predetermined unfavourable weather conditions occur. Real-time model predictions can be used to manage well test flaring by minimizing the "STOP/GO" situations while ensuring environmental protection needs are met.

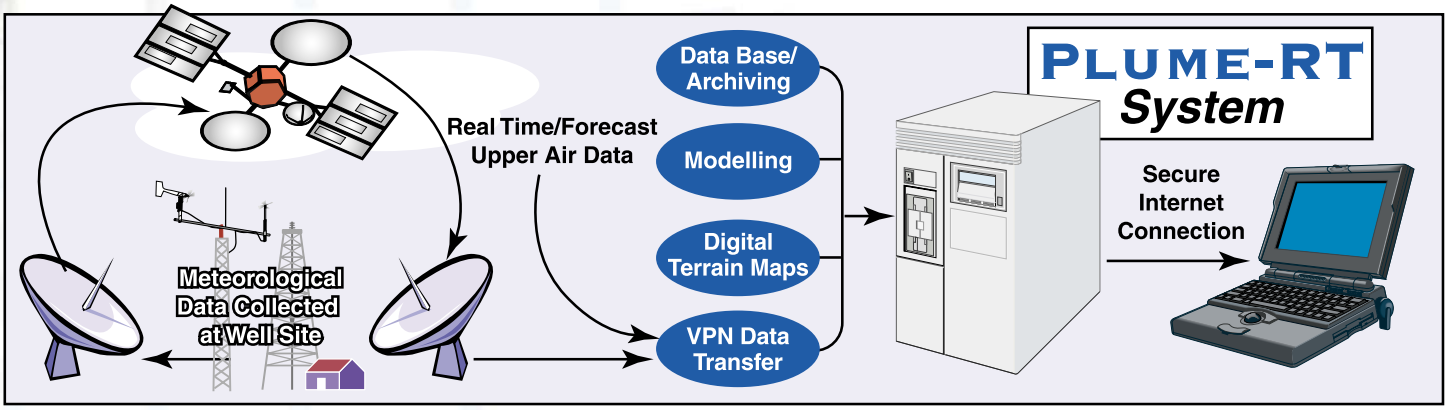
For unplanned accidental release events, potential release scenarios can be identified and prioritized. The release information can be combined with the ongoing collection of representative meteorological data to help prepare a multi-level emergency response management plan for potential emergency events. During an actual emergency, real-time predictions can be refined with on-site meteorological information to provide an indication of air quality changes.

BENEFITS OF REAL-TIME SYSTEMS

An integrated real-time modelling system shows the location and extent of the chemical plume to multiple users over the internet. Benefits include:

- A realistic representation of the transient nature of the magnitude and extent of the area potentially affected during a release event
- Immediate and remote system implementation (through a secure web site) to help emergency response personnel manage a real incident
- Access to 24 hour concentration forecasts based on continuously updated weather forecast information
- Improved siting of mobile and stationary ambient air quality monitors
- Availability for emergency drills and emergency response exercises
- Assistance to decision-makers when issuing air quality advisories

Incident command centres, emergency operating centres, and corporate headquarters can access the predictions using a secure internet connection, and then use this information to respond appropriately (i.e., determine evacuation needs).



DESCRIPTION OF RWDI'S PLUME-RT SYSTEM

RWDI started developing the PLUME-RT System in the fall of 2002, as a due-diligence response to potential critical sour well (containing H_2S) releases and for the management of sour gas well-test flaring programs in Alberta, Canada. The system provides the industry with the ability to respond proactively to SO_2 concentration events following the ignition of an uncontrolled sour gas well release or due to flaring. This is particularly important for large critical sour gas wells located near elevated terrain. The PLUME-RT system provides continuous dispersion model predictions on an hourly basis for 12 hour historical and 24 hour forecast periods.

The secure (128-bit encryption) web-based, client-ready interface is accessible 24 hours a day to multiple authorized users, allowing multi-level responses to a large-scale release event. The interface provides different user groups with different access privileges. For example, those with administrator privileges are able to alter the project parameters, while those with limited access are able to generate and view reports.

The PLUME-RT system runs on a set of dedicated servers on an isolated, dedicated network, with specific computers assigned to meteorological data collection, processing and internet support. All data and reports are archived on-line for future retrieval and forensic analyses.

RWDI uses 100 m resolution digital terrain data to generate appropriate base maps and grids for the project area in advance. The model predictions are superimposed over a 40 by 40 km base map.

The PLUME-RT system uses CALMET (a diagnostic 3-dimensional meteorological model) and CALPUFF (an air-quality dispersion model) to predict 1-hour average SO_2 concentration patterns.

The CALMET model uses historical and forecast upper air data available from the U.S. National Oceanic and Atmospheric Administration (NOAA). PLUME-RT can take advantage of CALMET's ability to use information from on-site meteorological towers to calibrate the wind field.

CALPUFF uses the wind field information generated by CALMET to account for the transport and dispersion in the presence of terrain features. The CALPUFF model also requires digital terrain data and source characterization parameters such as fluid composition, flow rate, well-bore diameter, elevation, and location.

A variety of reports is currently available from the PLUME-RT on-line user interface:

- Plume concentration animations superimposed on the base map (historical and forecast)
- Maximum ground-level SO_2 concentrations superimposed on the base map
- Time-series concentration plots at selected receptor locations
- Tables and plots showing exceedance values for selected concentration thresholds

The PLUME-RT system has the flexibility to use information from various meteorological and monitoring data systems. This allows the system to be used for a variety of applications. For example, the system can complement any ambient air quality-monitoring program by providing a better indication of spatial concentration variations. Other examples include supplemental emission control (e.g., reduced stack top temperatures), airshed management, cumulative exposure studies and odour tracking and management applications.

RWDI is committed to continuously improving the PLUME-RT system and developing real-time response systems for emergency and non-emergency planning applications. For more information and an introduction to the PLUME-RT system, please contact RWDI.

RWDI
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RWDI AIR Inc.
Guelph (519) 823-1311
Calgary (403) 232-6771
Vancouver (604) 730-5688

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