

TECHNOLOGY

Corrosion & Environmental Technologies

PURPOSE

The Environment and Corrosion team conducts research that protects NOVA Chemicals against recognized and emerging threats associated with environmental issues and pipeline integrity. Our team, which receives substantial outside funding from government and industry agencies, routinely collaborates with universities, research facilities, government regulators and other companies in the pursuit of cost-effective excellence. Much of the work we've done for our other business partners supports innovative risk reduction and management practices.

With a track record of collaboration and direct technical interaction with regulatory agencies in both pipeline and petrochemicals operations in various jurisdictions, NOVA Chemicals' Environment and Corrosion team has provided the company significant business benefits in recent years.

Research we have conducted on integrity concerns related to stress corrosion cracking and hydrogen-induced cracking in pipelines, and on the impact of ethylene emissions on vegetation around petrochemicals sites, has formed the basis for key regulatory decisions.

PEOPLE

Our team members have expertise in chemical and materials engineering, failure analysis, electrochemistry, biochemistry and applied microbiology. Our lab, field, and mathematical and physical modeling skills enable us to effectively apply our expertise to industrial problems and opportunities.

Collaboration with our Fluid Dynamics team enables us to further the reach of our research programs to include prediction of pipeline pressure fluctuations and failure modes as well as the dispersion of air emissions around petrochemical facilities.



ACTIVITIES/PROJECTS

Experimental programs in lab and field are coupled with computer modeling to simulate and predict the course of events, such as:

- the internal corrosion of pipelines
- the fate of metal ions released in the soil environment
- the creation of damaging conditions, and
- growth of corrosion and cracks under defective coatings in operating pressure systems.

We have evaluated and introduced new technology for improving the environmental performance of our operating sites in air emission control, water treatment and soil remediation.

To date, our accomplishments include:

- **New methods**
 - A method for monitoring intrinsic bioremediation based on stable isotope analysis of hydrocarbons
 - A high flow sampler to find fugitive emission sources in operating facilities.
 - A new electrochemical technique, EIS+, to assess coating degradation in operating environments
- **Improved air dispersion modeling**
 - Accepted models are being fine-tuned to give more realistic predictions of where air emissions go based on collection of real-time onsite meteorological data, source characterization and tracer studies.



- **Impact assessments**
 - The effect of ethylene emissions on vegetation surrounding our facilities is being assessed based on field data and joint industry studies done in collaboration with air emissions regulators.

Our project work often results in the development of risk management plans based on the creation and use of decision trees and databases for specific problems. An international consortium of pipeline companies, led by the Environment and Corrosion team at NOVA Chemicals Research and Technology Centre, collaborated in the development of a tool to assist in cost-effective pipeline integrity management.



The NOVA probe is a novel field tool, which allows the assessment of soil environments at pipe depth without excavation. Canada's National Energy Board recognizes the NOVA probe as a key component in controlling the risk of stress corrosion cracking problems on Canadian pipelines.

PARTNERSHIPS

The expertise of the Environment and Corrosion team is leveraged through extensive partnerships with universities which provide a network of resources able to address questions of phytotoxicity, atmospheric chemistry, stable isotope measurement, cracking and corrosion mechanisms, environmental monitoring, molecular biology and ecology, among others.

Scientists from both university and government laboratories (Canmet, NRC) as well as NSERC Industrial Fellows and graduate students have taken sabbatical leaves in order to work in our laboratories.

RECOGNITION

Our research programs have received internal and external recognition.

Technical leadership of the Alberta Ethylene Crop Study led to an Alberta Premier's Award as well as the NOVA Chemicals Responsible Care Award in 2004. This study resulted in a new and scientifically sound ambient air objective for ethylene emissions. This objective was based on impact data generated for agricultural crops and tree seedlings grown in the vicinity of petrochemical operations in Western Canada.

Development of an advanced phytoremediation technology for the safe, natural disposal of hydrocarbon wastes on petrochemical sites resulted from initial observations made in a school science project carried out in partnership with Crescent Heights High School in Calgary. Various stages of the work were recognized by The City of Calgary, the Calgary Board of Education and a Distinguished Applause Award by NOVA Chemicals itself in 2002.

Open and factual documentation of our greenhouse gas emissions and their management through voluntary actions has earned repeated recognition from Canada's Climate Change Voluntary Challenge & Registry Inc. (VCR). Our annual VCR reports have repeatedly received a Gold Status rating and various Chemical Sector Leadership Awards.



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