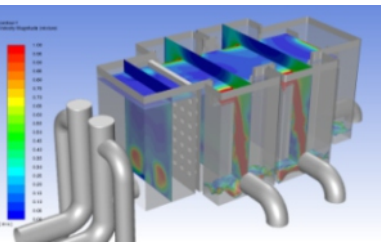
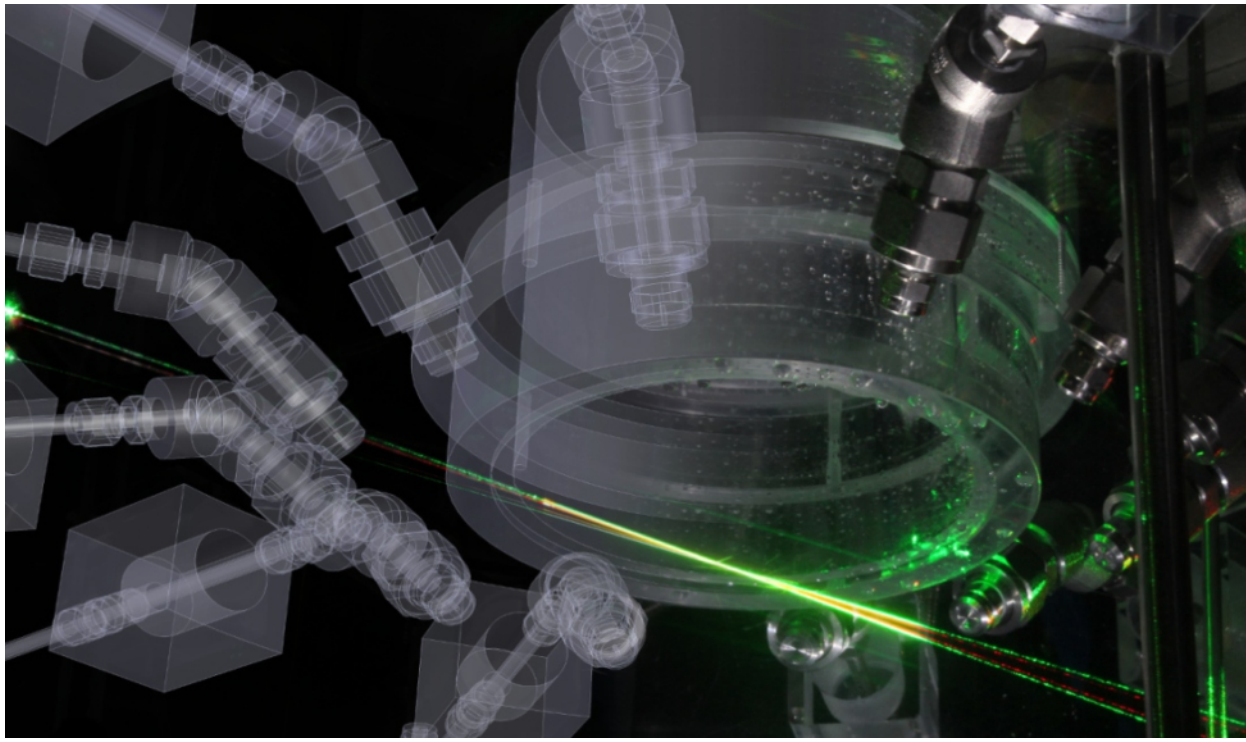
Coanda

A TETRA TECH COMPANY





Advanced Engineering Research Capabilities & Services

Linking your Business to the Science that Drives it

Corporate Overview

Since its founding in 1996, Coanda has built a legacy of *Leading with Science*® by providing innovative, technical solutions for clients all around the globe. We are passionate about solving some of the world's most difficult technical problems using the latest tools and technologies, offering a suite of industry-leading capabilities to tackle complex engineering science challenges for commercial customers, across a broad range of industries.

Strategic | Comprehensive | Client-focused

Coanda's highly knowledgeable engineering scientists bring world-class expertise using physical, numerical and analytical techniques to develop innovative solutions, whether solving challenges related to existing processes, or working on the development and optimization of new technologies.

Using our state-of-the-art facilities and advanced scale-up expertise, our technical teams support analytical simulations with sophisticated lab-scale experiments.


Coanda Head Office in Burnaby, BC

Canadian Roots | Multi-national Talent | Global Reach

Coanda has brought together scientists, engineers and technical staff from around the world to form our current team of over 65 employees, including over 25 Ph.D. research scientists and 25 Professional Engineers specializing in Chemical, Mechanical, Physics and Geotechnical disciplines, as well as Data Science, Machine Learning and Artificial Intelligence.

In 2021, Coanda became part of Tetra Tech, gaining access to the resources of a global, multibillion dollar company.

30+
Years of Engineering Research experience

65+
Technical staff including 25+ PhDs and 25+ P.Eng.

1500+
Projects executed in the last 3 decades

Expertise

Coanda has been involved with numerous projects across North America and beyond, providing specialized services to clients in many industries, assisting with design, troubleshooting upgrades, and debottlenecking, bringing advanced knowledge and expertise in key technical areas:

- Mixing
- Fluidization
- Geotechnical Science
- Tailings
- Rheology
- Non-Newtonian Flows
- Multiphase Flows
- Separation
- Nozzles, Jets and Sprays
- Gasification
- Data Science (including Big Data)
- Custom Control and DAQ software
- Advanced Instrumentation
- Artificial Intelligence & Machine Learning
- Tailings Treatment & Reclamation
- Flow-Induced Noise & Conditioning
- Reaction Chemistry & Thermodynamics
- Nozzles, Jets & Sprays
- Combustion
- Purging
- Ventilation
- Atmospheric Dispersion
- Cryogenics
- Forensics

Coanda Burnaby Physical Modelling Research Laboratory

Services

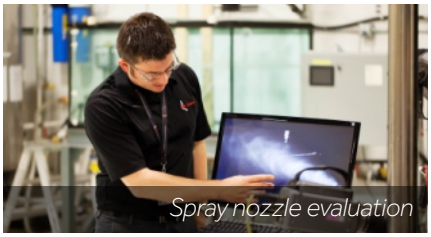
We take a holistic approach to tailor our solutions to each client's needs. We do not apply a "one-size-fits-all" strategy to problem solving. Rather, we use our breadth of expertise to tailor a solution, considering the details of the problem at hand.

Our integrated solutions combine extensive capabilities in physical, computational, and analytical modelling as well as also offering state-of-the art Machine Learning / Artificial Intelligence algorithms and data analyses with custom instrumentation and software.

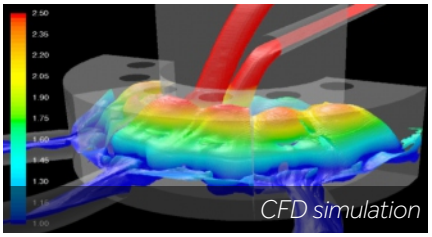
Process Modelling

We offer three key approaches to process modelling and optimization. This array of techniques allows for the optimum combination to be selected for any given problem.

- **Mathematical Modelling**
  This approach distills the most important aspects into a problem that is simple to solve by employing techniques such as integral momentum methods and empirical/semi-empirical correlations.
- **Physical Modelling**
  Many processes are difficult to study at full-scale. The flow environment may be hostile, inaccessible or suitable measurement techniques are not available, or costs are prohibitive. However, through the use of scale models it is possible to obtain useful data.
- **Computational Modeling**
  Computational Fluid Dynamics (CFD) is used as a design and optimization tool to predict the movement of fluids in, around and through systems without the need for a physical model. Processes involving heat transfer, chemical reactions and fluid flow can all be modelled using our CFD tools.



Spray nozzle evaluation



CFD simulation

Process Engineering

Our broad experience enables us to provide clients multidimensional insights to problem solving, circumventing the potential pitfalls associated with a narrower understanding. We offer specific process engineering services that include the development of process flowsheets incorporating new technologies.

Outcomes may include heat and material balances, development of reactor models, scale-up relationships, control strategies, process drawings, and cost estimates.

Scale-Up

The development of new industrial processes typically requires the scale-up of engineering processes and design criterion that have been optimized at reduced scale.

We have the expertise and experience to accurately characterize and measure the performance of small scale units such as bench-top and pilot-scale systems, and to develop appropriate commercial scale designs capable of achieving high production volumes while also meeting required process performance and product specifications.

Multi-phase flow loop model

Services - continued

Technology Development Support

We support the development of emerging technologies by providing the technical insight and hands-on experience needed to bring them to fruition and advance through various Technology Readiness Levels (TRLs). We support nascent technology through all of the life-cycle phases:

- Concept / discovery
- Scoping / business case evaluation
- Technology development & Proof-of-Concept
- Engineering design
- Testing & validation of prototypes / pilot
- Final design, marketing & launch

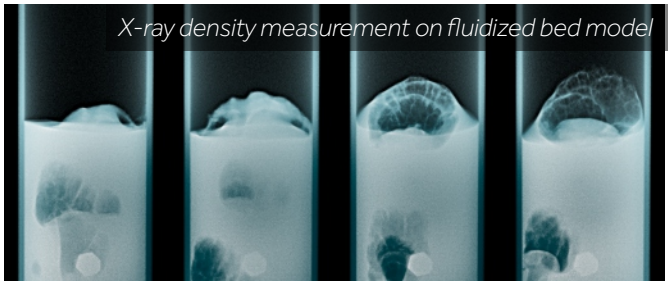
Artificial Intelligence, Data Science & Analytics

Our team of PhD-level mathematicians and physicists use the most recent Big Data Analytics and Machine Learning techniques to leverage data from instruments in a plant, remote sensors, or customer transactions.

These state-of-the-art analysis tools generate insights, identify patterns and extract correlations. With new levels of understanding our clients can improve existing processes or develop new ones.

Instrumentation & Equipment Design

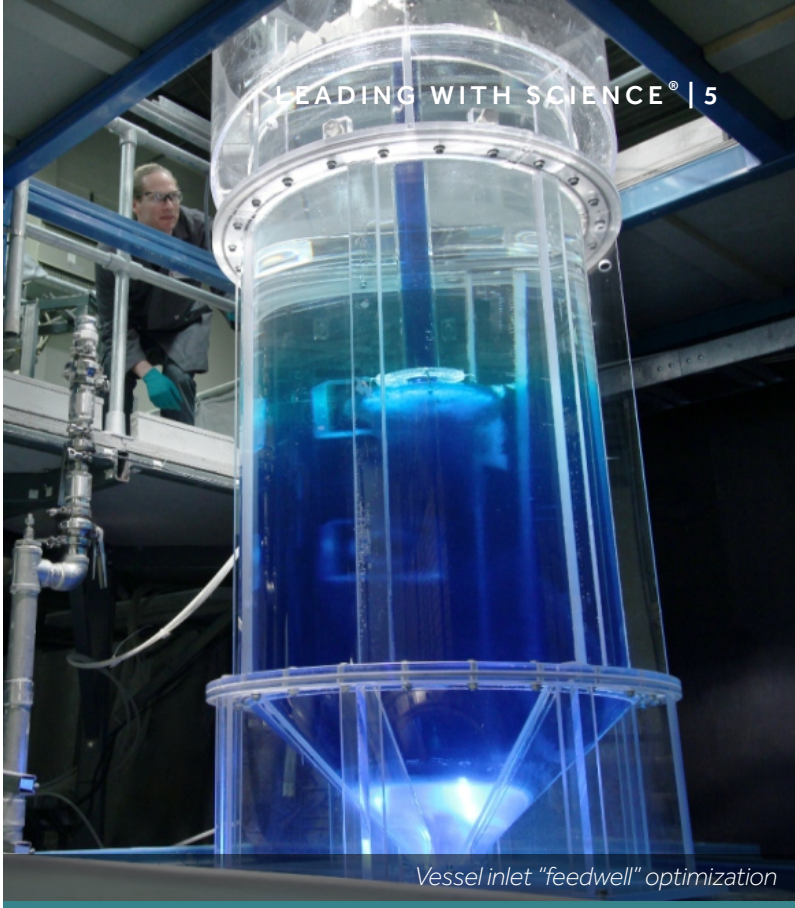
We have been designing and building custom research equipment and instrumentation for our on-site laboratories as well as for client facilities for over two decades. We specialize in turning real-world challenges into manageable lab-based apparatus.



X-ray density measurement on fluidized bed model

Intellectual Property Rights

For many of our clients, protection and preservation of intellectual property (IP) is of critical importance, as their proprietary designs, ideas and processes are paramount to business success. Coanda ensures that IP is handled with maximal security, and any new IP developed in projects with us typically accrues to the client.



Vessel inlet "feedwell" optimization

Analytical Chemistry

Coanda's analytical capabilities include a suite of industry-standard analyses. These techniques, focused on providing precision results to clients in mining and tailings-related sectors, can be adapted to handle a variety of sample types and matrices found in a wide range of other industries:

- Particle Size Distribution & Sizing by Laser Diffraction
- Identification & Clay Content by X-Ray Diffraction
- Insoluble & Solids–Bitumen–Water by Solvent Reflux
- Characterization of Vapour-Liquid Equilibrium
- Detailed Hydrocarbon Analysis by GC-FID/Mass Spectrometry
- Diluent & Solvent Content in Tailings by GC-FID
- Simulated Distillation by High-Temperature GC-FID
- Permanent Gases by micro-GC TCD
- Anion & Cation Analysis by Ion Chromatography
- Total Organic/Inorganic Carbon by Combustion Analyzer
- Total Nitrogen by Thermal Decomposition & Chemiluminescence
- Water Content by Automated Karl Fischer Titration
- Quantitative Analysis by UV-Vis Spectrophotometry
- Rheological Properties

Fluidized bed models in our Burnaby laboratory

Facilities | Infrastructure

Strategically located in Western Canada's three largest cities, Coanda's growing presence spans over 65,000 ft² split between our head office in the heart of Metro Vancouver; a second fully-equipped research facility in Edmonton, and a satellite office in Calgary.

British Columbia (Head Office)

Coanda's head office is located in Burnaby on the outskirts of Vancouver. Key infrastructure at this location includes:

- Experimental laboratories (cold flow models, spray test facilities, cryogenics, high pressure test facilities, etc)
- Advanced computing cluster (supporting state-of-the-art FEA and CFD simulation)
- Analytical laboratory (wide range of bench top analytical measurements – rheology, particles size, surface tension, etc)
- Engineering office (scientific analysis, design and process engineering, instrumentation design, data processing, software development, etc)
- Electronics laboratory (fabrication of advanced instrumentation and electronics)
- Corporate offices (administration, accounting, human resources, marketing and sales, with extensive conference and training facilities)
- Machine shop (model and equipment fabrication)
- Warehousing (extensive parts and fabrication materials inventory)

Alberta

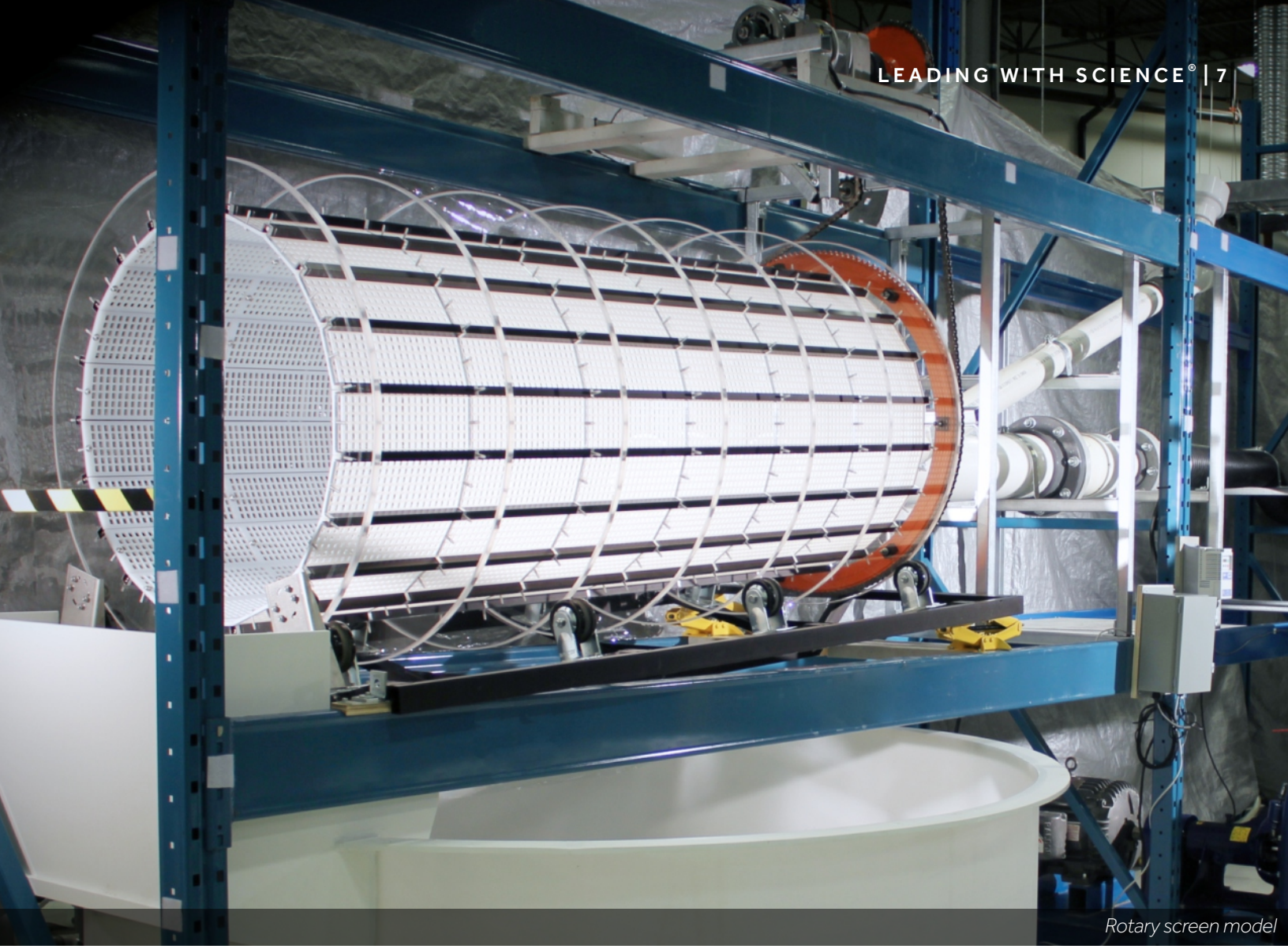
We operate two branches in Alberta, offering experimental testing services at our research laboratory in NW Edmonton and providing technical consulting services from offices conveniently located in Calgary's downtown core.

The Edmonton facility provides very similar technical capabilities to our Burnaby location, including experimental and analytical laboratories, workshop, warehousing, as well as conference and training facilities. Analytical Chemistry services include Gas Chromatography, X-Ray Diffraction and many other advanced measurements.

In-House Equipment

Coanda maintains a variety of permanent infrastructure and instrumentation equipment that clients can utilize for their research purposes: complex liquid and gas piping loops, spray testing equipment and visualization tanks as well as a large array of pumps, blowers and compressors, flow meters, and other instruments that can be customized to a client's specific needs.

LIF measurement technique



Rotary screen model

Industries

We are devoted to addressing complex industrial and environmental challenges across a broad spectrum of industries and sectors. We work closely with each of our clients to define their critical challenges and key requirements to develop strategies that are designed to deliver game-changing results in a timely and cost-effective manner.

- *Water & Wastewater*
- *Plastics*
- *Carbon Capture*
- *Oil & Gas*
- *Pipeline Systems*
- *Chemical*
- *Petrochemical*
- *Mining*
- *Environmental Science*
- *Cleantech*
- *Oilsands*
- *Pharmaceutical*
- *Alternative Energy*
- *Government*
- *Building Sciences*
- *Pulp & Paper*
- *Biotechnology*
- *Agriculture*
- *Aerospace*
- *HVAC*

Rheological measurement

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TETRA TECH

As part of the Tetra Tech group of companies, Coanda's innovative, sustainable solutions help our clients address their water, environment, infrastructure, resource management, energy, and international development challenges. We are proud to be home to leading technical experts in every sector and to use that expertise throughout the project life cycle. Our commitment to safety is ingrained in our culture and at the forefront of every project. We combine the resources of a global, multibillion dollar company with local, client-focused delivery.

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