

Produce + Reduce

Pursuing Perfection in Advanced Membrane Gas Separation Solutions



 **vaperma**
Gas Separation Solutions

Permeate

Vaperma is committed to developing the most creative and innovative methods of supplying the latest in membrane solutions for biofuels, natural gas, and chemical process applications.



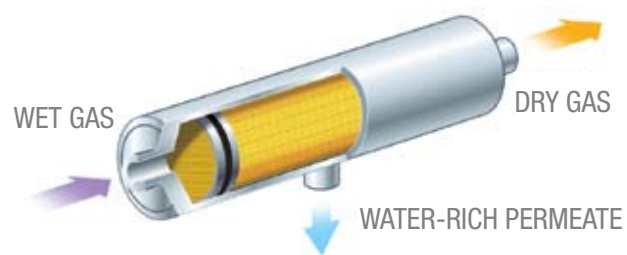
Advanced Membrane for Gas Separation

Vaperma's Siftek™ technology is an advanced membrane separation solution for the dewatering of ethanol and many other chemicals. It also finds applications in the upstream production of natural gas. Compared to existing conventional methods such as distillation, molecular sieves and gas absorption, energy savings of as much as 50% are achieved.

Technology Principles

Siftek™ membranes are filters that permit water vapor to be separated from other vapor compounds in a gas mixture. These membranes are made of a blend of polymers that have specific morphological and chemical properties. The high permeability of water across the membrane is due to relatively high adsorption and diffusion rates. The separation occurs by virtue of a driving force which, in the case of Siftek™, is the steam's partial pressure on either side of the membrane.

Wet gas is “dewatered” by selective permeation of water vapor through the membrane. Membranes are hollow polymeric fibers packed in a shell and tube configuration to form a module. Water vapor is separated in a simple continuous process that produces a dry gas.



Plug-and-Play Solutions

The Siftek™ module rack is a self-contained system that is easily integrated and designed to optimize the plant footprint. All of the key components of the dewatering system are mounted on a skid including membrane modules and ancillary equipment.

Preserve

Sustainability through energy conservation and the reduction of carbon footprint.



Energy Conservation

Vaperma has developed a breakthrough technology that replaces energy-intensive distillation and molecular sieves. This revolutionary membrane is simple to implement and maintain. Providing a real and measurable reduction in the amount of plant heat energy required for the purification of various biofuels and chemicals, its carbon footprint is significantly reduced.

Reduction of Carbon Footprint & Carbon Credits

Vaperma established a partnership with ClimateCHECK Inc. to confirm the greenhouse gases carbon credits created by the Siftek™ membrane technology. Through a proprietary monitoring system, GHG emission reductions are quantified in a credible and accurate manner that adheres to recognized industry standards and programs, including ISO 14064-2 standard and the Voluntary Carbon Standard Program.

Vaperma customers can receive real-time results related to GHG emissions, through appropriate templates that report and support the documentation, thereby creating tradable carbon credits.

Life Cycle Value Assessment

Vaperma uses life cycle thinking based on a formal Life Cycle Value Assessment (LCVA) tool. Highly effective and comprehensive, LCVA covers everything from manufacturing raw materials by third party vendors, to waste disposal and reclamation of our membrane products.

The thorough analysis and information gathered by this helpful tool facilitates smart and responsible business decisions at Vaperma. This results in more sustainable product designs and manufacturing practices that ensure long-term benefits and results.

Environmental Commitments

Both sustainable development and employee health & safety are primary concerns to Vaperma and integral parts of our long-term strategy. At Vaperma, we believe that supplying innovative products and services in a manner that meets the social, environmental, and economic expectations of stakeholders (employees, shareholders, customers, communities, governments, and advocacy groups) creates a solid foundation for growth.

Profit

Maximize profit with the new advanced gas separation solutions.



Wide Range of Industrial Applications

The Siftek™ polymeric membrane system provides a high selective separation of water from various gas mixtures and organic vapors. As a result, Vaperma membrane-based systems provide efficient and reliable solutions to various industries with substantial energy savings.

- **Refining of Oxygenated Biofuels** (ethanol, methanol, butanol & biodiesel)

Vaperma has proven expertise in retrofit/upgrading and Greenfield projects for the refining of fuel grade ethanol from any feedstock (sugarcane, corn, and others).

- **NextGen Biofuels** (cellulosic ethanol)

Typically cellulosic fermentation liquor alcohol concentration is low, and the refining step can be energy intensive compared to traditional distillation technologies. Advanced Siftek™ membrane technology offers a breakthrough alternative that lowers energy consumption and carbon emissions and produces high quality fuel grade biofuel products.

- **Chemicals** (IPA, methanol, ethyl acetate, and several others)

Siftek™ membranes provide an innovative method of separating water from azeotropic and non-azeotropic mixtures of water and organic compounds including alcohols, esters, ketones, and assorted other light, water-soluble compounds.

- **Natural Gas**

Water present in natural gas and biogas can form gas hydrates which plug valves and pipelines. Glycol dehydration processes generate methane, BTEX, and VOC emissions. The Vaperma end-of-the-pipe treatment solution promises methane recovery and very low emissions from the still column vent.

Perform

Vaperma teams up with its customers to optimize their membrane systems performance.



Project Execution

Vaperma is an integrated membrane solutions provider. Building upon a foundation of deep understanding of membrane science and sound engineering, Vaperma's strength is based on its ability to manufacture cost effective hollow-fiber polymer membranes, while always adhering to the integral relationship between membrane performance and system cost.

Vaperma's experienced engineering staff offers a full range of value-added services to support and assist our customers with process design and system supply.

- **Design and Engineering**

Vaperma offers comprehensive product development and engineering services by integrating innovative design with sound engineering principles.

- **Manufacturing Facility**

The Vaperma facility uses state-of-the art spinning technology to manufacture polymeric hollow fibers. System design and assembly are flexible to meet customers' needs.

- **Project Management**

Through careful planning and staffing, Vaperma has assembled a unique team with a diversity of skills and industrial expertise to help support their clients from project definition through plant commissioning.

- **Commissioning and On-going Support**

Our commitment to your business success means we stand behind our solutions. Vaperma has developed a commissioning program for client personnel including class-room and onsite field training. We also offer our expertise and depth of knowledge for process optimization ensuing membrane life and equipment system reliability.

Partnerships

Take an active role in the emerging renewable energy market.



Leverage Key Business Relationships

The development and maintenance of key business relationships is crucial to Vaperma's success. Vaperma is currently in negotiations with several value chain partners to commercialize its products and services in targeted markets.

Vaperma has established a highly skilled, efficient, and dynamic organization. Its intellectual property rights and manufacturing are developed and maintained internally while commercialization and servicing will be shared with partners. Vaperma is a world-class partner with strong financial and management resources to meet an aggressive time-to-market strategy:

- Focus on reaching profitability through our membrane product sales in the existing biofuels and natural gas energy markets and through revenue-generating engineering service contracts.
- License the Siftek™ membrane technology to carefully selected partners in specific applications in the chemical industry.
- Structure operations by partnering with qualified subcontractors so as to minimize our involvement in detailed design, fabrication, and installation of complete turn-key systems.

Vaperma develops, manufactures, and supplies advanced gas separation systems. Focusing on the commercialization of a proprietary polymeric hollow-fiber membrane system, Vaperma substantially reduces energy consumption and lowers greenhouse gas emissions.

The backbone of Vaperma's technology development is its R&D strategy. Always striving to further the field of polymeric membrane science, the Vaperma team operates in a state-of-the art research & technology center which includes laboratories and a fully automatized membrane manufacturing line. The company has also aptly demonstrated the capabilities of its membrane product line in the ethanol industry in North and South America.

At Vaperma, we put all our energy into innovation because we truly believe our results will make a world of difference.

Your plant deserves the best

2111, 4^e Rue, bureau 101
Saint-Romuald (Québec) Canada G6W 5M6
T : 1 418 839-6989

www.vaperma.com



Gas Separation Solutions