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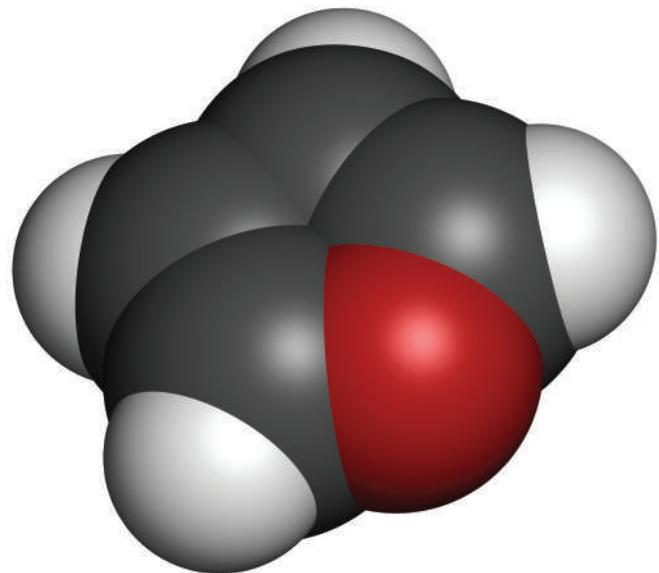
PENNAKEM®

RENEWABLE RESOURCE CHEMISTRY



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PENNAKEM[®]

RENEWABLE RESOURCE CHEMISTRY

HISTORY

The original production facilities constructed in Memphis, TN in 1943 were built by the US Government and operated by Quaker Oats. Corn cobs were harvested from the surrounding farm lands and used as the feedstock to prepare furfural. Furfural was a key raw material used in rubber and nylon production to support the war effort.

Over the next forty years, Quaker Oats operated the facility, expanding the product line to other furfural-derived products such as furan, furfuryl alcohol, and tetrahydrofurfuryl alcohol. In 1983, Quaker Oats divested the facility to QO Chemicals. Two years later, the facility was sold to Great Lakes Chemical.

Great Lakes Chemical continued to develop the furfural-based product line and built dedicated facilities to produce PolyMEG, a polymer of tetrahydrofuran used in Spandex[®] fibers. The year 1999 saw Great Lakes sell the facility to a private equity group; the resultant new company was named Penn Specialty Chemicals. During this period the company focused on high-value intermediates for agricultural, pharmaceutical, and industrial applications. In 2008 the company was sold to its present owner, the Brussels-based Minafin Group, and renamed Pennakem.

ABOUT US



WHO WE ARE NOW

In 2008 the majority of the assets of Penn Specialty Chemicals, Inc., were purchased by the Minafin Group and Pennakem, LLC was established. The Minafin Group is a Belgium-based company with five brands industrially present in North America and Europe. The brands include Minakem, which focuses on the pharma market, with advanced intermediates, APIs, high potency APIs, and controlled substances incorporated in pharma products. Minasolve targets cosmetic ingredients. Minascent possesses skills in handling highly hazardous chemicals and specialized chemical reactions under a variety of demanding quality assurance programs. Pressure Chemical has a unique set of equipment making them an industry leader in high pressure chemistry, niche polymers and scale up services.

Pennakem continues to operate as an autonomous business unit with full service manufacturing, pilot facilities, R&D, and worldwide sales and marketing, all focusing on renewable chemistry while developing new and innovative products and processes for customers.





“Over 70 years of Innovation in Sustainable Bio-based Chemistry”

SUSTAINABLE CHEMISTRY

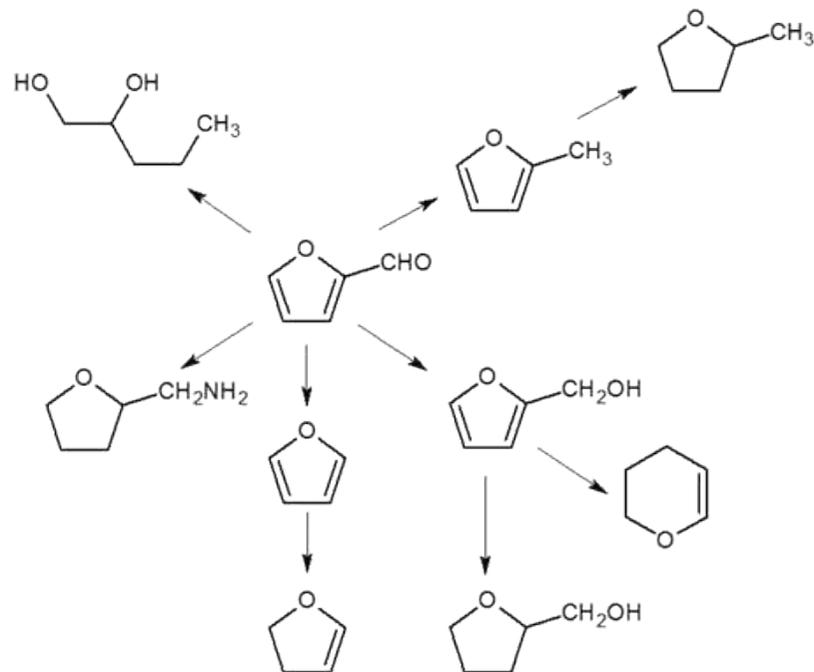
What started as a recovery of furfural from agricultural residues from surrounding farmlands has transformed into a broad portfolio of fine chemicals used to enhance our customers’ products and processes. With the development of this product portfolio came expertise in hydrogenation, fractional distillation, oxidation, reductive amination, and heterocyclic chemistry.

In addition to starting with sustainable building blocks, sustainability is at the forefront of Pennakem’s process design. Many of the processes are operated in the absence of solvents. If solvents are required for process efficiency, solvent recovery and recycling is designed into the process. Catalysts in various processes are recovered and reclaimed. Hydrogen is generated on-site on demand.

Pennakem can help you meet your performance and sustainability goals with our broad portfolio of innovative, sustainable products and processes.



FURFURAL PRODUCT TREE



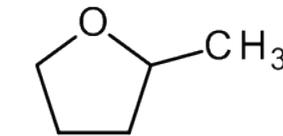
“Enhanced Performance with Value-Added Bio-based Solvents and Fine Chemicals”

VIRIDISOL®

Biobased Solvents and Fine Chemicals

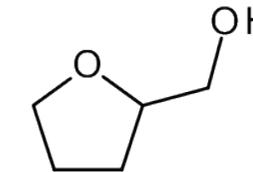
Pennakem’s line of bio-based products provides enhanced performance in our customers’ products and processes in a wide range of applications such as solvents, catalysts, modifiers, and industrial intermediates. Viridisol®M has been demonstrated to increase process yields in certain chemical reactions and has low water solubility, eliminating the need for an extraction solvent. Viridisol®M separates cleanly from water, allowing for easy recovery to an anhydrous form for recycling, thereby minimizing production costs and reduces waste. Furfuryl Alcohol derivatives have been reported as key components in smart coatings and shape-memory self-healing polymers.

Pennakem’s innovative bio-based products provide unique performance benefits including: Increased yields, improved product quality, lower overall costs and potential use as a scaffold for the development of novel, new products. Reach out to Pennakem to discuss how our bio-based products can enhance your products and processes.



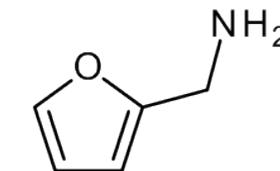
Viridisol®M

CAS No. 96-47-9



Viridisol®T

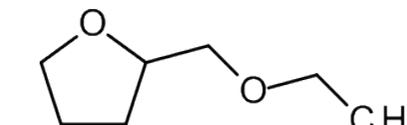
CAS No. 97-99-4



2-Furfurylamine
CAS No. 617-89-0



Furan
CAS No. 110-00-9



Viridisol®E

CAS No. 62435-71-6



“Delivering superior Results through Core Competencies”



“Achieving Your Ultimate Goal in a Fast, Cost-effective and Reliable Manner”

Core Competencies

Throughout our 75 year history in fine chemical manufacturing, Pennakem has developed a unique set of integrated core competencies. These core competencies have been applied in the conversion of both bio- and petro-based feedstocks into value-added fine chemicals. We would be pleased to discuss how these competencies can be applied to meet your needs.

Hydrogenation

- Vapor Phase
 - Continuous
 - Temp to 250°F (121°C)
 - 5-10psig (0.7 Bar)
- Liquid Phase
 - Continuous and Batch
 - Temp to 450°F (232°C)
 - Pressure to 600psig (41 Bar)
- Trickle Bed
 - Continuous
 - Temp to 440°F (227°C)
 - Pressure to 1700psig (117 Bar)



Distillation

- Continuous Columns
 - 20-stage
 - Coupled with hydrogenation trains
- Batch Columns
 - 15-stage
 - Rated for full vacuum

Batch Unit Operations

- Acylations
- Alkylations
- Hydroxymethylation
- Reductive Amination
- Thermolytic Rearrangements
- Oxidations

Concept to Commercialization

Pennakem thrives on applying decades of expertise in our core competencies to meeting your unique needs. Custom designed products/processes can be developed in our dedicated R&D labs through to commercial production in our flexible manufacturing facilities based on your specific requirements.

Pennakem has all the tools in place to develop, scale up optimize, and produced economically products to meet your specific needs.



R&D

- Well equipped lab, both synthesis and analytical.
- Experienced PhD's for process development and process optimizations.
- Entrepreneurial, efficient, responsive.

Pilot Plant

- Reactors
 - Glass, stainless, hot tube
- Distillation
 - Flash, fractional, falling film
- Solids handling
 - Centrifuge, dryer

Manufacturing

- Small scale drum quantities
- Batch volumes from 10 MT to 100's MT
- Continuous production to 100's MT

MINAFIN[®]

GROUP

About Minafin

Minafin is a global fine chemicals developer and manufacturer with an industrial presence in four countries. In total, Minafin is comprised of six factories and five R&D labs. In Europe, two industrial sites are located in France, one in Belgium and one in Germany. All of the European sites are FDA approved. In North America one industrial site is located in Tennessee and the other is in Pennsylvania.

The group activities of Minafin include custom manufacturing, proprietary synthesis of active ingredients and building blocks, process and development, and blends and formulations.

Minakem, Dunkirk, France



Minascent, Leuna, Germany



*Minakem Beuvry
Lille, France*



*Minakem
Mont-Saint-Guibert, Belgium*

PENNAKEM[®]
RENEWABLE RESOURCE CHEMISTRY



PRESSURE[®]
ACHEMICAL
YOUR SCALE UP PARTNERS

MINAKEM[®]
FINE SERVICES FOR LIFE



MINASOLVE[®]
BIO-INGREDIENTS FOR YOUR APPLICATIONS

MINASCENT[®]
CHALLENGING CHEMISTRY