An aerial photograph of a large industrial facility, likely a Milliken plant, surrounded by dense green trees. A winding river or stream flows through the foreground. In the background, a multi-lane highway runs parallel to the facility. The sun is low on the horizon, creating a warm, golden glow across the sky and reflecting off the water.

**2022**  
MILLIKEN & COMPANY

## Overview

Milliken™

A stone pillar with a plaque for Deering Milliken & Co. Inc. is positioned next to a green hedge. The background shows a blue sky and trees.

## OVER 150 YEARS OF EXCELLENCE

- Founded in 1865 in Maine
- Privately held, fifth generation
- Diversified Industrial company
- Recognized for innovation leadership and manufacturing excellence

DEERING  
MILLIKEN  
& CO.  
INC.



150+

Years of Solving the  
World's Problems at a  
Human Level



Community  
of Innovators



INNOVATION

Idea Development  
Research Experiment  
Improvement Concept

5000+  
Global Patents

40+

Manufacturing  
locations



15

Countries



8000+

Associates



11,000+

Products



## MILLIKEN AT A GLANCE



APPAREL



AUTOMOTIVE



BUILDING AND  
INFRASTRUCTURE



CONSUMABLES



DURABLES



HOSPITALITY



INDUSTRIAL



MEDICAL



MILITARY



PACKAGING

# MILLIKEN BUSINESSES

## TEXTILE



Apparel  
Industrial  
Automotive

## CHEMICAL



Colorants and Ingredients  
Plastic Additives  
Fine Chemicals

## FLOOR COVERING



Carpet  
Luxury Vinyl Tile  
Mats

## HEALTHCARE



Wound Dressings  
Compression Bandages  
Hemostatic Dressings

## WHAT MAKES MILLIKEN DIFFERENT



Driven by Curiosity



Design with Purpose



Deliver Essential Performance

# RESPONSIBLE MANUFACTURING



**PLANET**

*Obligation to reduce our footprint*





**PRODUCT**

*Material sciences expertise to discover new solutions*



**PEOPLE**

*Caring for people and communities*



**ETHICS**

*Tradition of doing the right thing*

## COMPANY AWARDS



## ANOTHER SUSTAINABILITY MILESTONE

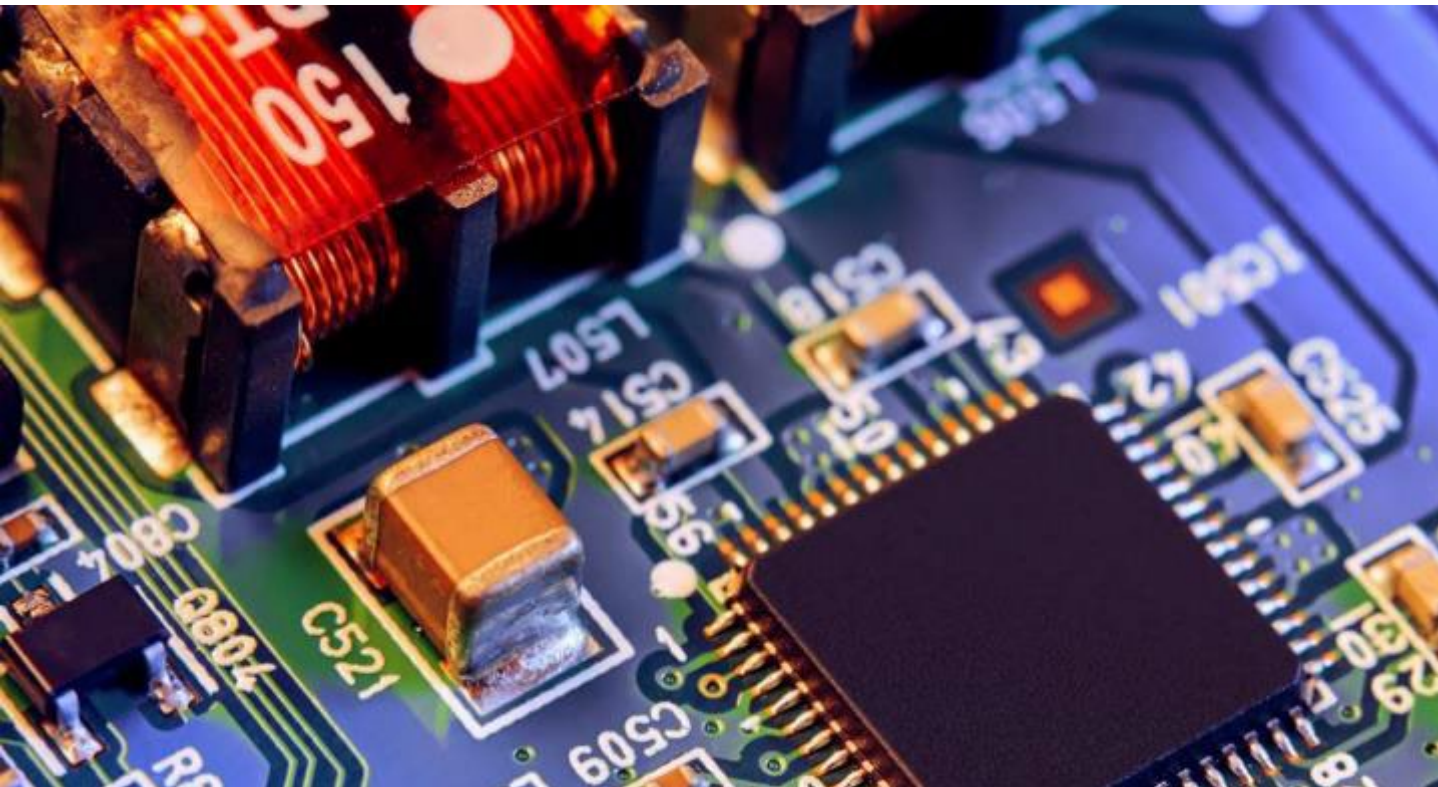


**MILLIKEN IS AMONG TOP 7% OF MOST  
SUSTAINABLE COMPANIES BY ECOVADIS**

# MILLIKEN'S CHEMICAL DIVISION TODAY



## MILLIKEN'S CHEMICAL DIVISION - FINE CHEMICALS

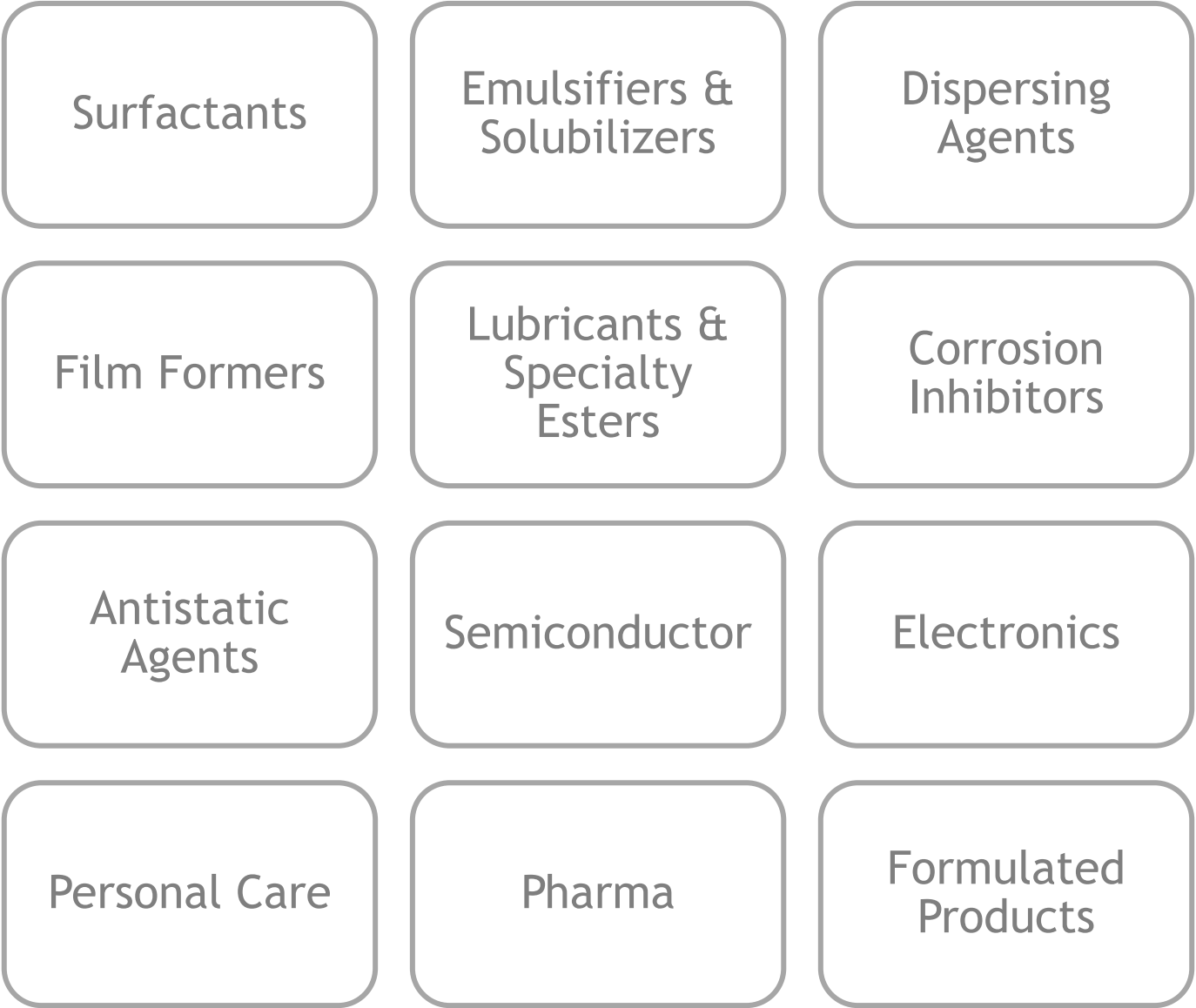


We specialize in the manufacturing of Custom Fine Chemicals commonly used in multiple markets with high quality requirements. Our specialty additives are also used in coatings, lubricants and other intermediate applications.

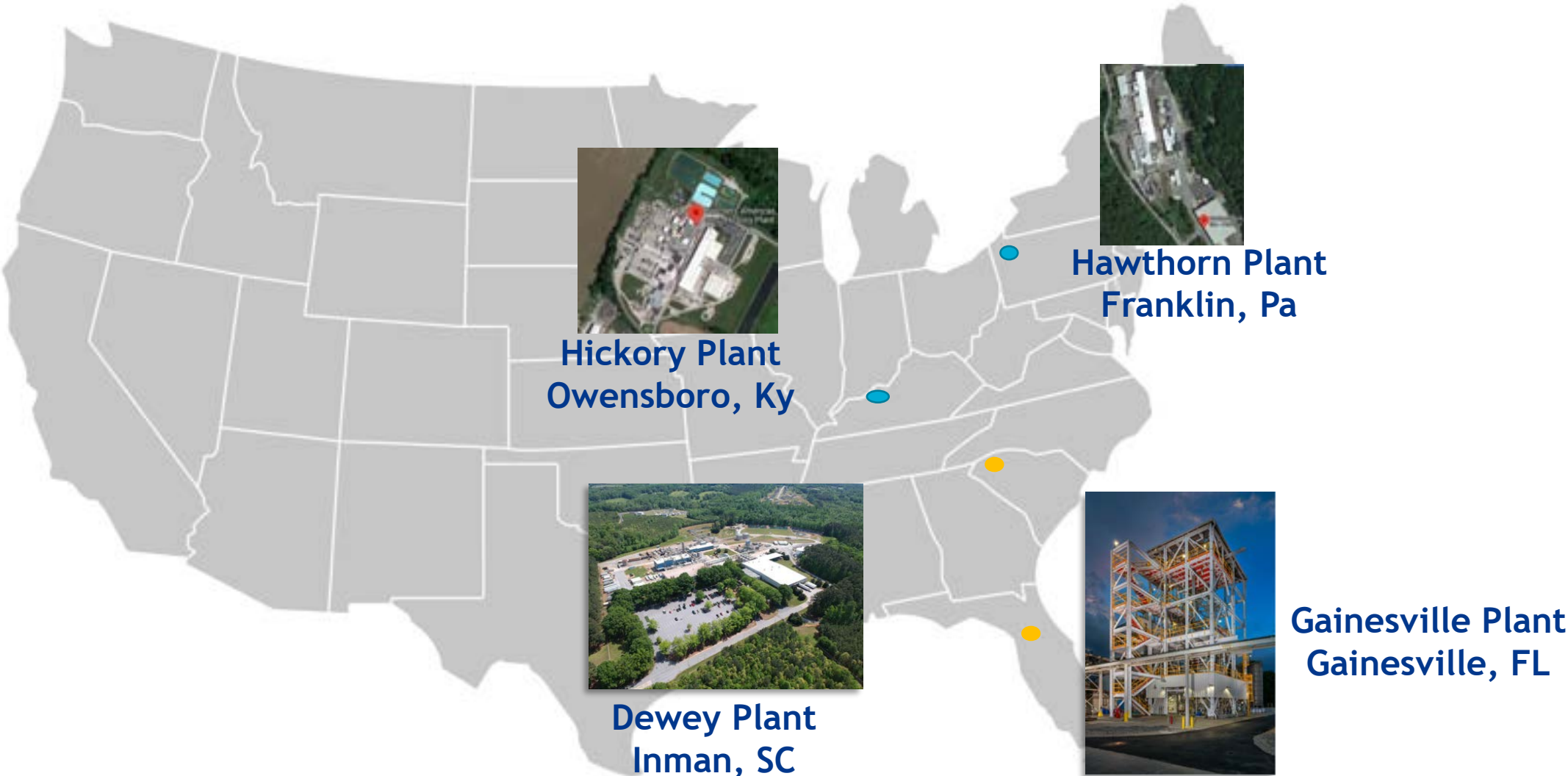


# FINE CHEMICALS

- Semiconductors
- Silicones
- Organic Fine Chemicals



FINE CHEMICAL MANUFACTURING FOOTPRINT; ADDED 2 NEW SITES IN 2023



SPECIALTY PRODUCTS AND CUSTOMER MANUFACTURING

Milliken Specialty Silicones SILICONE ELASTOMER MODIFIERS

Milliken uses base chlorosilanes to manufacture a wide variety of silanes, siloxanes, silicones and MQ resins. We have the capabilities to tailor hydride and vinyl containing siloxanes by fine tuning variables such as Molecular Weight, Functionality, Functional Concentration and Purity to meet specific customer requirements. Milliken has over 60 years of experience in providing rapid and confidential support to safety scale up each custom projects from lab to multi-ton production.



Hydride Crosslinkers are used to increase durometer (hardness) and tear strength of Platinum Addition Cure Silicone Elastomers. For the Linear Hydrides (M2000 Series), Milliken can produce products with a total vinyl up to 30% volatile content. Each point, and modified D4 may also be tailored to meet customer specifications.

Product	Type	SH Content (g/g)	Weight % Si	Introduction	Product Code
Di-Si-H	Linear Hydride (M2000 Series)	1.25	0.75	Excellent synergy with chain extenders to increase tear and elongation	200004-0028
M2000-M2000-Resin-Resin	Resin Hydride	0.5	0.50	Noncrosslinker and low strength	200004-0029
M2000-M2000-Resin-Resin	Resin Hydride	0.5	0.50	Noncrosslinker and low strength	200004-0030
Phenylsilane (M2000 Series)	Specialty Hydride	0.5	1.0	Improves all physical properties and increases cost speed	200004-0031

Hydride Chain Extenders (also called Coupling Hydrides) are used to increase tear strength and elongation of Platinum Addition Cure Silicone Elastomers. For the M2000 Series, Milliken has the capabilities to readily produce from 100 up to 1000% volatile content. Each point, and D4 content may also be tailored to meet customer specifications.

Product	SH Content (g/g)	Weight % Si	Product Code

Specialty Silicones and Cyclic Hydrocarbons PHARMACEUTICALS

Milliken offers silanes, siloxanes and specialty chemicals like norbornadene to the pharmaceutical industry and their toll manufacturers for the synthesis of high quality active pharmaceutical ingredients (API). We uniquely offer rapid response combined with confidentiality and a highly-flexible manufacturing organization to help you succeed.

Milliken Products are frequently used as:

Protecting and Blocking Agents

Protection-deprotection and chemoselective reactions.

Reducing Agents

Our silicone hydride compounds are proven reducing agents, acting as hydride donors or hydrogen atom transfer agents in radical reactions. These are often good alternatives to complex metal hydrides.



STRUCTURE	PRODUCT	FUNCTIONALITY	PRODUCT CODE	CAS NO.
	Cyclohexylsilane	Drug intermediate	300006-0010	544-25-2
	Dimethylsiloxane	Protecting group	Available upon request	75-78-5
	Hexamethylsiloxane	Protecting group	300006-0028	999-87-3
	Norbornadene	Drug intermediate	300006-0033	131-46-0
	Polymethylhydrosiloxane	Reducing agent	Available upon request	9304-73-3
	Tetramethylsiloxane	Reducing agent	300006-0029	5271-26-7
	Triethylsiloxane	Protecting group	300006-0036	984-30-9
	Triethylsilane	Reducing agent	300006-0029	627-86-7

If you do not see the specific product for your needs, Milliken has the capabilities to custom manufacture specialty chemicals to your specifications. Please contact us.

Milliken EO/PO Fine Chemical Products

PRODUCT NAME	FUNCTIONALITY	ORDER	CAS NO.	MOLECULAR WEIGHT	FUNCTIONALITY NUMBER	STATUS
1,4-CYCLOHEXADIENE						
Spn-Fac 8001	1,4-CYCLOHEXADIENE	EO	126-73-1	98	191-486	Regulatory Chemical
Spn-Fac 8002	1,4-CYCLOHEXADIENE	PO	2470-36-8	98	290-326	Commercial
Spn-Fac 8003	1,4-CYCLOHEXADIENE	EO	126-73-1	98	290-326	Commercial
1,6-HEXANEDIOL						
Spn-Fac 8004	1,6-HEXANEDIOL	EO	126-73-1	98	191-486	Regulatory Chemical
Spn-Fac 8005	1,6-HEXANEDIOL	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8006	1,6-HEXANEDIOL	EO	126-73-1	98	191-486	Regulatory Chemical
Spn-Fac 8007	1,6-HEXANEDIOL	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8008	1,6-HEXANEDIOL	EO	126-73-1	98	191-486	Commercial
BISPHENOL A						
Spn-Fac 8009	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8010	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8011	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8012	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8013	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8014	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8015	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8016	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8017	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8018	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8019	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8020	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8021	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8022	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8023	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8024	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8025	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8026	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8027	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8028	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8029	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8030	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8031	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8032	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8033	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8034	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8035	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8036	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8037	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8038	Bisphenol A	EO	126-73-1	98	191-486	Commercial
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Spn-Fac 8040	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8041	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8042	Bisphenol A	EO	126-73-1	98	191-486	Commercial
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Spn-Fac 8050	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8051	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8052	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8053	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8054	Bisphenol A	EO	126-73-1	98	191-486	Commercial
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Spn-Fac 8056	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8057	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8058	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8059	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8060	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8061	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8062	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8063	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8064	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8065	Bisphenol A	EO	126-73-1	98	191-486	Commercial
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Spn-Fac 8080	Bisphenol A	EO	126-73-1	98	191-486	Commercial
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Spn-Fac 8082	Bisphenol A	EO	126-73-1	98	191-486	Commercial
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Spn-Fac 8087	Bisphenol A	EO	126-73-1	98	191-486	Commercial
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Spn-Fac 8160	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8161	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8162	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8163	Bisphenol A	EO	126-73-1	98	191-486	Commercial
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Spn-Fac 8165	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8166	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8167	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8168	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8169	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8170	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8171	Bisphenol A	EO	126-73-1	98	191-486	Commercial
Spn-Fac 8172	Bisphenol A	EO	126-73-1	98	191-486	Commercial

PRODUCT NAME	UNIT	PRICE
<b>1,4-CYCLOHEXANONE</b>		
Spec No. 9003	kg	10
Spec No. 9004	kg	10
Spec No. 9005	kg	10
<b>1,6-HEXANTRIOL</b>		
Spec No. 9006	kg	10
Spec No. 9007	kg	10
Spec No. 9020	kg	10
Spec No. 9021	kg	10
Spec No. 9022	kg	10
Spec No. 9023	kg	10
<b>BIPHENYL A</b>		
Spec No. 9008	kg	10
Spec No. 9009A	kg	10
Spec No. 9010	kg	10
Spec No. 9006A	kg	10
Spec No. 9009	kg	10
Spec No. 9025	kg	10
Spec No. 9009A	kg	10
Spec No. 9010A	kg	10
Spec No. 9020	kg	10
Spec No. 9006	kg	10
Spec No. 9027	kg	10
Spec No. 9028	kg	10
Spec No. 9009A	kg	10
Spec No. 9010A	kg	10
Spec No. 9009	kg	10
Spec No. 9008A	kg	10
<b>TRIFLUOROLAMINE</b>		
Spec No. 15A-01	kg	10
Spec No. 150	kg	10
Spec No. 15	kg	10
<b>METHANOL</b>		
Spec No. 15-1501	kg	10
<b>4-CUMYL PHENOL</b>		
Spec No. 9010	kg	10
<b>GLYCERINE</b>		
Spec No. 9010	kg	10
Spec No. 9020	kg	10
Spec No. 9023	kg	10
Spec No. 9009	kg	10

## Anhydrides and Custom Blends

### Anhydride Products

- ### Anhydride Free Acid Products

- DQSA Free Acid in Aromatic: 150
- DQSA Free Acid in Xylene
- QSA Free Acid

### Anhydride Applications

- Corrosion inhibitors
- Epoxy curing
- Fuel additives
- Oil additives
- Plasticizers
- Starch modifiers
- Toner resins
- Unsaturated polyester resins

Milliken  
Specialty Chemicals  
and Intermediates

A broad chemistry portfolio with flexible manufacturing capabilities to produce unique products and custom solutions.

Innovation and Manufacturing Excellence

For more than 50 years, Milliken & Company has been developing and manufacturing specialty products for our industrial partners. We pride ourselves on working closely with customers to deliver unique products and solutions that fit their needs and exceed their expectations. Milliken's laboratory facility uses the latest research tools and prepares product sample for customer testing, optimization and qualification. Our manufacturing facilities offer flexible capabilities over a broad range of equipment, with a fully dedicated pilot plant staff and equipment for scale up.

### Unparalleled Customer Service

- Dedicated chemists for scale-up of new products
- Dedicated laboratory assets for alloylation trials and new product development
- Customer focused supply chain team
  - Meet packaging needs from 1 gallon to FTI
  - Sourcing of components for specific formulations
  - Custom manufacturing and blending capabilities

### Best-in-Class Equipment

- Alkylolation reactors ranging from 100 gallons to 5,500 gallons
- Solids separation and filtration equipment
- Hot oil, steam, tempered water, cooling water and chilled water utilities

### Manufacturing & Environmental Expertise

- ISO 9001 and 14001 certified
- On-site biological wastewater treatment
- Direct rail access



### Chemistry Types

## Allergy platform

- *Myrtaceae* Order
- *Proteaceae* Order

### Quantization

- **Sodium Sulfate**

### References

### Phenolphthalein

- Phosphoric Anhydride
- Phosphorus Oxide

### Tuition

- \* See
- <http://www.elsevier.com/locate/bsc>

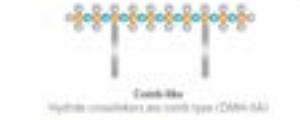
### Antihypertensives



Milliken  
Specialty Silicones

SILICONE ELASTOMER  
MODIFIERS

Milliken uses basic chlorosilanes to manufacture other hydride and vinyl containing silicones by the *and* *Position* to meet specific customer requirements to safely scale up both custom projects from lab to



**Hydride Crosslinkers** are used to increase the

Product	Type
DMH-5A	Linear Hydride
MDH-8 MDHydride Resin/Neop	Resin Hydride
MDH-9 MDHydride Resin/Neop	Resin Hydride
Phenylsilane (MDHydride) silane	Specialty Hydride

**Hydride Chain Extenders** (also called Core-Silicone Elastomers) are used to increase the

Product
MDH-5A (Linear Hydride)
MDH-8 (MDH)
MDH-9 (MDH)
MDH-10 (MDH)
MDH-11 (MDH)

**Vinyl Polymers**

Product
Vinyl Polymer 100
Vinyl Polymer 200
Vinyl Polymer 400
Vinyl Polymer 1000
Vinyl Polymer 2000
Vinyl Polymer 5000
Vinyl Polymer 10000
Vinyl Polymer 20000
Vinyl Polymer 40000

Specialty Silicones and  
Cyclic Hydrocarbons

PHARMACEUTICALS

Milliken offers silanes, silicones and specialty chemicals like norbornadene to the pharmaceutical industry and their

Milliken Products are frequently used as:

- Protecting and Blocking Agents**  
Protection-deprotection and chemoselective reactions
- Reducing Agents**  
Our silicone hydride compounds are proven reducing agents, acting as hydride donors or hydrogen atom transfer agents in radical reactions. These are often good alternatives to complex metal hydrides.

STRUCTURE	PRODUCT	FUNCTIONAL
	Cyclohexylsilane	Drug Informant
	Dimethylchlorosilane	Protecting group
	Hexamethyldisiloxane	Protecting group
	Norbornadene	Drug Informant
	Polydimethylsiloxane	Reducing agent
	Tetramethyldisiloxane	Reducing agent
	Triethylchlorosilane	Protecting group
	Triethylsilane	Reducing agent

If you do not see the specific product for your needs, Milliken has the capacity

Milliken  
Specialty Silicones

CUSTOM MANUFACTURING

Milliken offers *highly-flexible custom manufacturing capabilities*, with *rapid and confidential* support to customers requiring *reactive silicone-based intermediates and fine chemicals*. We specialize in handling *hazardous and reactive materials in bulk quantities* and *sourcing basic chlorosilanes as starting materials* for a wide variety of products.



**Products**  
Silanes | Silicones | Siloxanes | MQ resins | Fine chemicals

**Production Equipment**  
Milliken's facility adheres to high quality and safety standards and is equipped with several different reactors capable of handling grams to hundreds of tons per year:

- 50 to 2000 gallon (190-7600 liter) **TR reactor systems**
  - Glass lined steel, stainless steel, and Hastelloy C-276
  - Integrated distillation columns
- 100 to 700 gallon (380-2700 liter) **Autoclaves**
  - 500 psi (3450 kPa) rating
  - SS and Alloy-30
- **Ti batch & continuous distillation columns**
  - 2" to 24" (5-61 cm) diameter, 5-60 theoretical plates
  - All-glass, glass lined steel, stainless steel and carbon steel
- **All systems built to explosion proof electrical requirements**

**Reaction Technologies**  
More than 10 types of unique transformations:

- Diels-Alder (Example: Norbornadene)
- Bulk silicon equilibration
- Exceptional Hydroxylation and Halogenation capabilities
- Grignard reaction: Reactors with capacity of 450 to 2000 gallon (1700-7600 liter)
- High temperature / high vacuum reactions (250 - 280°C)
- High purity, low metal content end-products

**Analytical Capabilities**

- Ship-to-spec and ship-to-control
- Metrology for analytical ICP, MS, Geiger RSR, product fingerprinting
- Chromatography and spectroscopy instrumentation: GC, GC/MS, LC, LC/MS, IC/MS, IC systems
- 24/7 analytical lab supporting R&D and 24/7 manufacturing



## Metal Carboxylate Chemistry

### Metals

Barium  
Bismuth  
Calcium  
Cobalt  
Iron  
Lithium  
Manganese Acetic  
Potassium  
Tin  
Zinc  
Zirconium

### Acids

2-Ethyl Hexanoic  
Neodecanoic  
Stearic  
Lauric  
Naphthenic  
Propionic

### Solvents

DEG  
EG  
Mineral Spirits  
Mineral Oils

## Equipment & Capabilities

- SS316 Reactors (1500 - 10000 gallons)
- Blending
- Pastillation
- Quality Control Lab
- Shipping
  - Tank Wagons, Totes, Drums, Pails, Boxes



## Specialty Polymers

- PVdC - Vinylidene Chloride with various secondary monomers (various acrylates, acrylic acid, acrylamide, acrylonitrile, etc.) Chemistry (current)
- Vinyl Acetate Chemistry [PVA] (past)
- Styrene Butadiene Chemistry [Copol] (past)
- Polyurethane Chemistry (TDI based) [Hypol] (past)
- DMDNB (2,3-dimethyl-2,3-dinitro butane) chemistry (taggant for plastic and sheet explosives) [DMDNB] (past)
- Daxad dispersing agents Chemistry (methacrylic acid and methyl methacrylate) [Daxad]

## Monomers

- ~12 tanks
- Vinylidene Chloride
- Acrylonitrile
- Methyl Acrylate
- Methyl Methacrylate
- Butyl Acrylate
- 2-Ethylhexyl acrylate



# CHEMISTRY AND PROCESSING TYPES

Hydrolysis, Alcoholysis, Ammonolysis

Silanol Condensation

Alkoxylation, Halogenation

Hydrosilylation, Acetylene, Olefins

Grignards and other organometallics

Alkoxylation, EO & PO

Emulsion and standard polymerization

Esterification

Phosphation

Sulfation - Sulfamic Acid

Anhydrides



# PILOT CAPABILITIES

## Staffing

- as required by Process Development & R&D Techs

## Reactors

- 1L-100 gallon glass/SS

## 2 Batch distillation columns

- 30 theoretical plate, 50 gallon, glass/SS
- 40 theoretical plate, 50 liter, glass

## 2 Continuous distillation columns

- Dedicated for Electronic materials

## WFE

- 6" diameter, 316SS, electric heat

## Support equipment

- 0°C (glycol)
- Vacuum & fume scrubbers

# MANUFACTURING CAPABILITIES

## Staffing

- 24 hours / 7 days a week

## Reactors

- 1000-2000 gallons, GLS
- 100 - 6500 gallon, 316SS
- One reactor with distillation column
- 200-500 gallon Autoclaves (500 psi)

## 3 Dedicated Batch distillation columns

- 25 theoretical plate, 18" diameter, SS
- 30 theoretical plate, 18" diameter, glass/GLS
- 40 theoretical plate, 18" diameter, GLS

## Support equipment

- Vacuum & fume scrubbers
- Non-aqueous, low temp cooling
- Filtration
- Thermal Oxidizer

## Bulk storage & tanker handling

- Bulk tanks (10,000-20,000 gallons)

# How can we help you grow?

## The Milliken Promise

Confidential  
custom support



Flexible  
environmental  
permits



Quick feasibility  
assessment:  
less than 2 day  
turnaround in  
most cases



State-of-the-  
art **analytical**  
**capabilities**  
supporting high  
**quality, change**  
**management**  
and **ship-to-spec**  
commitment



Rapid **process**  
**development**  
and **technology**  
**transfer**



The on-site R&D  
**team** provides  
round-the-  
clock support to  
manufacturing  
and operations to  
ensure successful  
technology scale-up



**Volume**  
**Flexibility:**  
from grams to  
kilograms to tons



**Hazardous**  
**chemistry**  
expertise



Global footprint



Together we strive to positively  
impact the world around us  
for generations to come.

The logo for Milliken is written in a white, elegant script font. The word "Milliken" is followed by a small trademark symbol (TM).

BOOTH 101