

Eastman — a leading sustainable innovation company

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Booth 610 | STLE 2023 Long Beach, California

EASTMAN

A global industry leader

- Founded in 1920.
- Fortune 500 specialty materials company with 2022 revenue of ~\$10.6B
- Global manufacturer and marketer of advanced materials and specialty additives
- Operates four business segments
- Global team of ~14,500 with headquarters in Kingsport, Tennessee
- Serves customers in > 100 countries



A broad global presence

North America Global HQ: Kingsport, Tennessee
Employees: ~10,100
R&D and technology centers: 5
Manufacturing sites: 14
2022 sales revenue: \$4.7B

Europe, Middle East and Africa Regional HQ: Rotterdam, The Netherlands
Employees: ~2,100
R&D and technology centers: 4
Manufacturing sites: 9
2022 sales revenue: \$2.8B

Asia Pacific
Regional HQ: Singapore
China HQ: Shanghai
Employees: ~1,400
R&D and technology centers: 2
Manufacturing sites, including joint ventures: 10
2022 sales revenue: \$2.4B

Latin America
Employees: ~400
Manufacturing sites: 3
2022 sales revenue: \$616M

45%

6%

26%

23%

 Percent of total 2022 sales revenue

A diverse portfolio of businesses



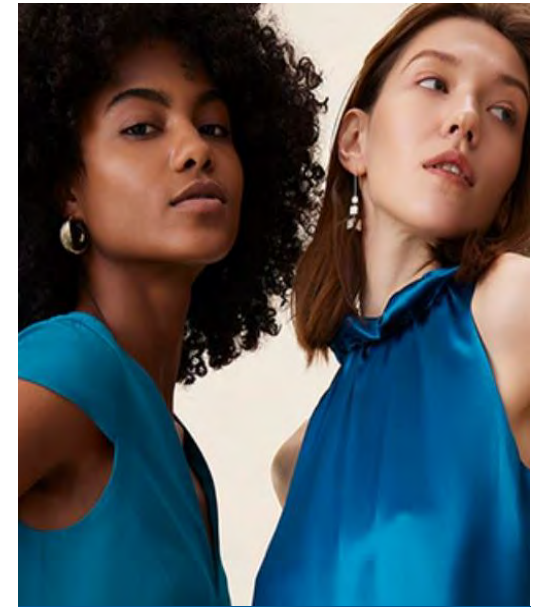
Additives &
Functional Products
2022 sales revenue: \$3.2B
30% of total Eastman sales



Advanced
Materials
2022 sales revenue: \$3.2B
31% of total Eastman sales



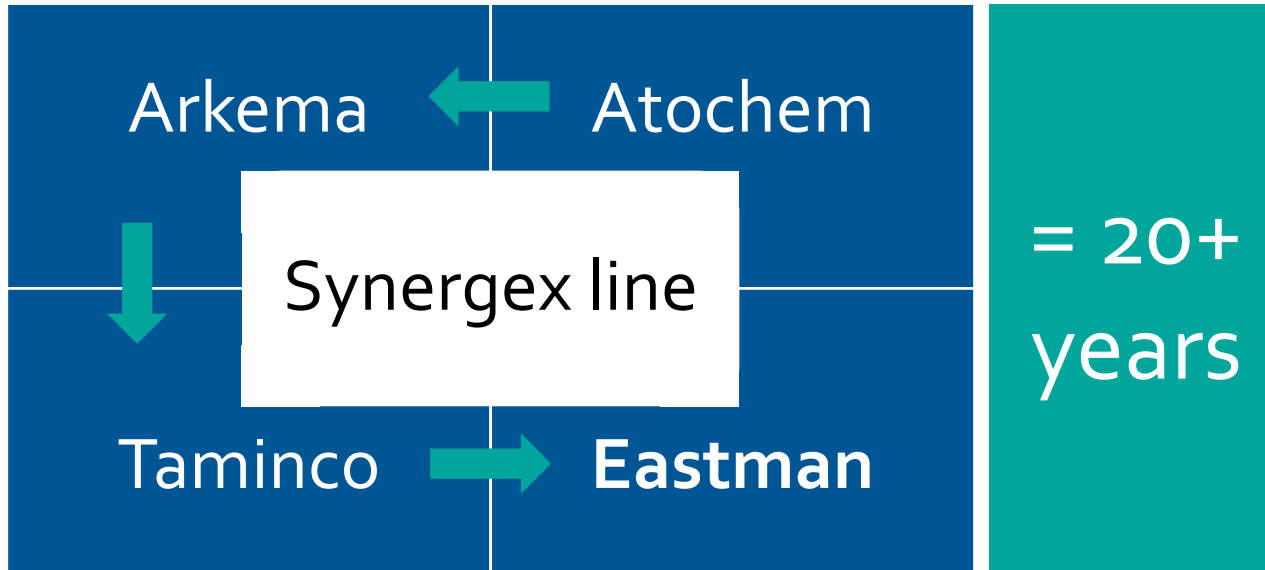
Chemical
Intermediates
2022 sales revenue: \$3.0B
29% of total Eastman sales



Fibers
2022 sales revenue: \$1.0B
10% of total Eastman sales



Synergex™ multifunctional amine additives for metalworking fluids



Amines are not just for pH control/buffering.

- ✓ Corrosion protection
- ✓ Extend fluid life
- ✓ Foaming
- ✓ Emulsion stability



Synergex (flagship product but secondary amine) → best amine for most applications/formulations in MWF

Amines for Metalworking Fluids

Synergex T
Synergex LA
Synergex T Plus
MDEA(Amietol M12)
C8/10 amides

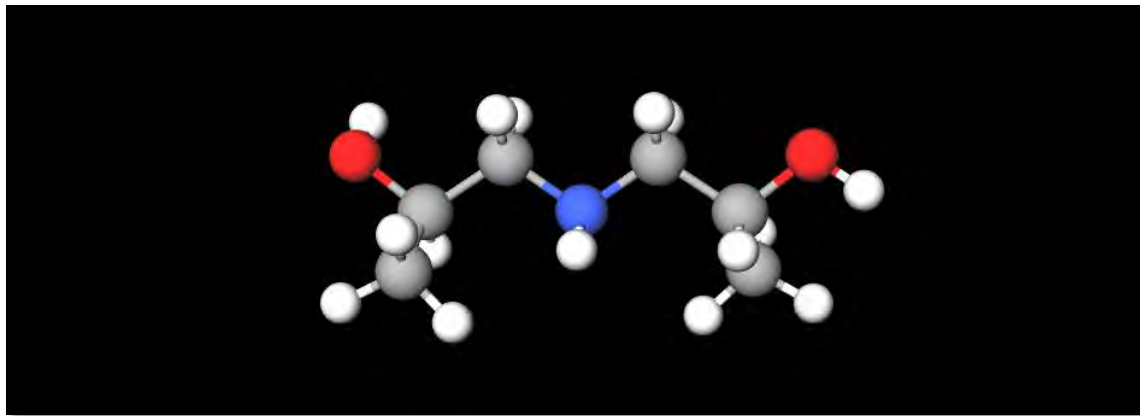
Pure, discrete amines. Typically, 99%+ assay

Synergex T (tertiary)

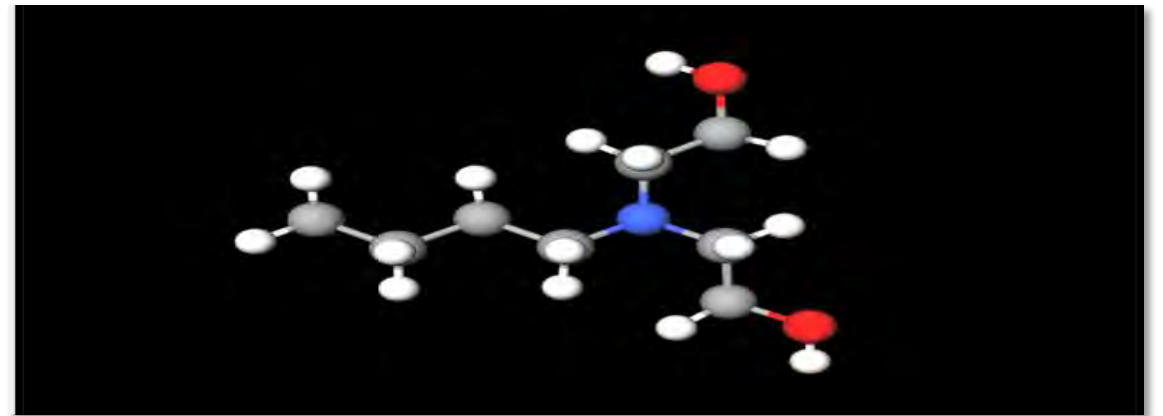
As a replacement for diisopropanolamine (DIPA)

Elimination of a secondary amine for a tertiary amine

DIPA



Synergex T



Similarity of physical and chemical properties

DIPA

- Molecular weight: 133.19
- Color: water white
- Odor: odorless
- pH (0.5% in DI water): 10.42
- Vapor pressure: 0.035 (50C)

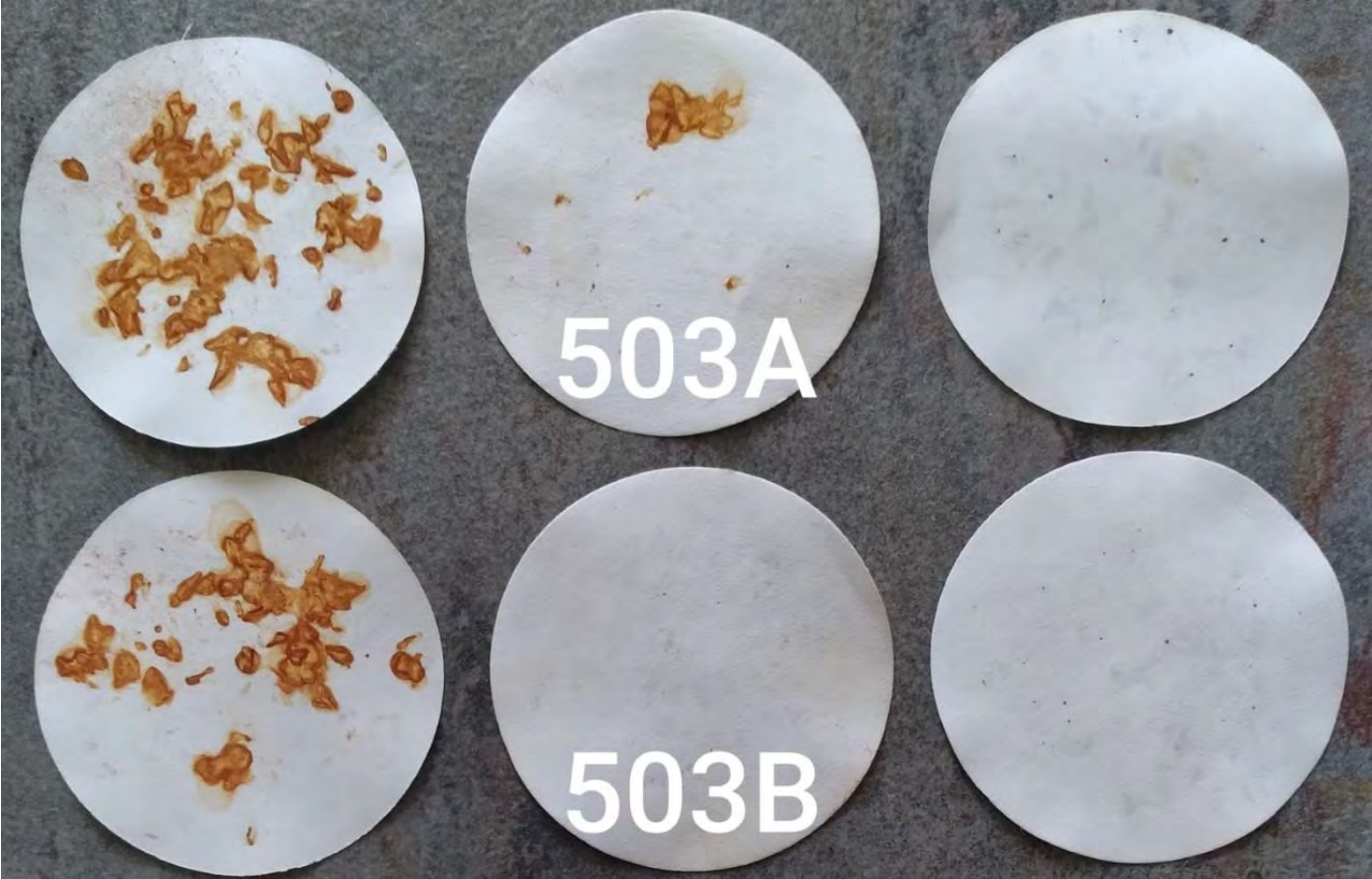
Synergex T

- Molecular weight: 161.3
- Color: water white
- Odor: odorless
- pH (0.5% in DI water): 10.44
- Vapor pressure: << 0.01 mm HG (20C)

Ease of substitution in typical formulations

| Sample formulation | 503A | 503B (Eastman amines) |
|-----------------------------------------------------|------|--------------------------|
| Ergon HyGold 100 (100 SUS naphthenic oil) | 20.0 | 20.0 |
| Polartech® EA 700 (polymeric emulsifier) | 7.0 | 7.0 |
| Altapyne® M-28B (high rosin tall oil fatty acid) | 2.0 | 2.0 |
| TAS DL-960 (amide; ACC) | 4.0 | 4.0 |
| Synative LF-420 (nonionic emulsifier; BASF) | 5.0 | 5.0 |
| AE-43 (EO/PO alcohol; ACC) | 3.0 | 3.0 |
| AKYPOTEC AM (ether carboxylate; KAO) | 1.5 | 1.5 |
| Rhodafac® AS 010 (aluminum stain inhibitor; Solvay) | 1.0 | 1.0 |
| Troyshield® FX40 (fungicide; Troy) | 1.0 | 1.0 |
| DIPA 95% (DOW) | 5.0 | --- |
| DGA | 2.0 | 2.0 |
| Synergex T (Eastman) | --- | 5.0 |
| Cola®Cor 232 (corrosion inhibitor blend; Colonial) | 6.0 | 6.0 |
| DI water | 40.0 | 40.0 |
| TT50 (sodium tolyltriazole 50%) | 0.5 | 0.5 |
| Triazine (bactericide; Troy) | 2.0 | 2.0 |

Improved cast-iron chip corrosion protection



2%

3%

4%

Synergex T

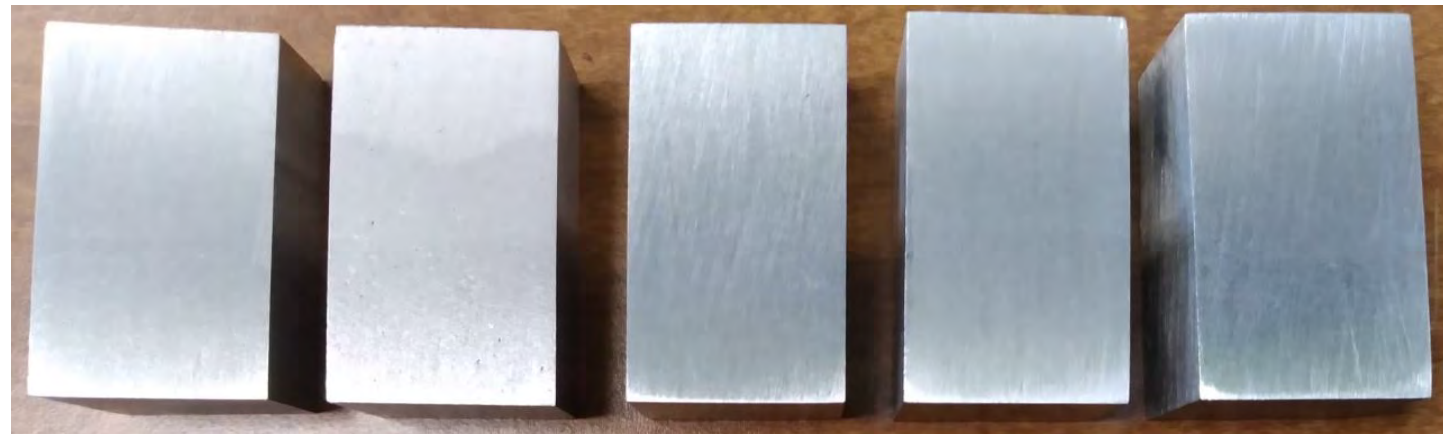
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Equivalent aluminum corrosion protection

503A



503B

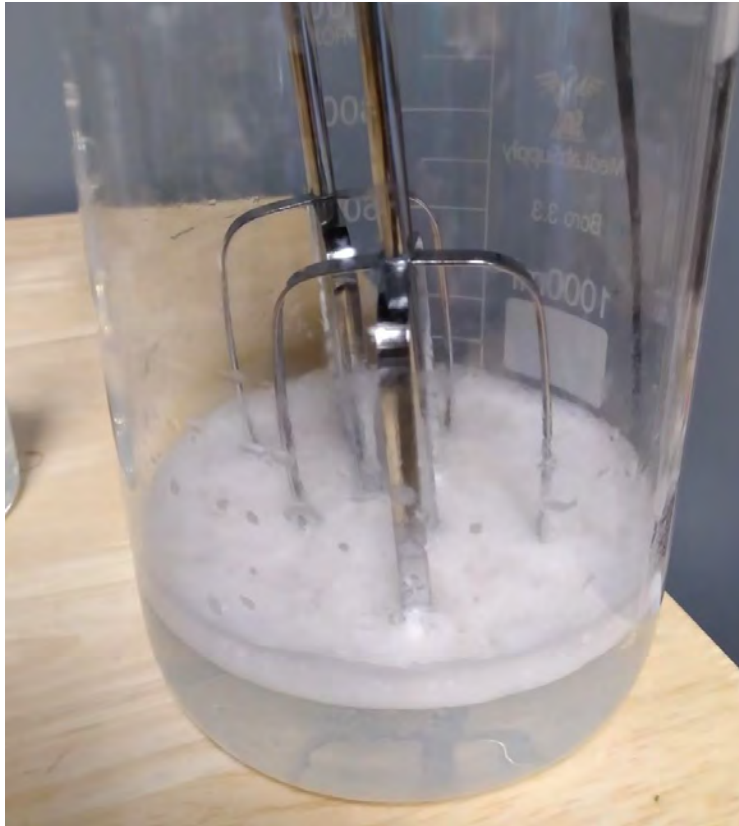


Synergex T



Reduced foaming profile

503A



503B



Synergex T

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Marginal cost increase in formulations

| | A | B |
|-------------------------------------------------------------------------------|----------|----------|
| DIPA 95% (Dow) | 5.0 | ---- |
| DGA (Huntsman) | 2.0 | 2.0 |
| Synergex T | ---- | 5.0 |
| Cost for amine portion of formulation (per pound) | \$0.1815 | \$0.1940 |
| Cost for amine portion of formulation (per gallon) Density = 8.2 lb/gallon | \$1.49 | \$1.59 |

| Amine | Cost |
|------------|--------|
| DIPA 85% | \$2.41 |
| DGA | \$3.05 |
| Synergex T | \$2.66 |

Conclusions/summary on Synergex T

- Replacement of secondary amine with a very low odor tertiary amine
- Similarity of chemical and physical properties
- Ease of substitution in typical metalworking formulations
- Improved cast-iron chip test performance
- Equivalent aluminum corrosion protection
- Reduced foaming profile
- Only marginal increase in the cost of formulations incorporating this substitution
- Other benefits previous discussed — improvement in pH stability and fluid life

Synergex LA (lipophilic)

A multifunctional amine additive for high-oil metalworking fluids

Intro to Synergex LA



Synergex LA is a multifunctional amine for metalworking fluids that can offer enhancements to formulations that typical alkanolamines cannot.



Its hydrophilic-lipophilic structure offers unique coupling ability even at relatively low percentages; lipophilic/hydrophobic HLB



This coupling ability is evident in increased concentrate stability as well as emulsion stability.



Synergex LA also offers synergistic properties with conventional metalworking biocides and extends fluid life.

Ease of substitution in typical formulations

| Sample Formulation | 405A | 405B (Eastman amines) |
|-----------------------------------------------------|-------|-----------------------|
| Ergon HyGold 100 (100 SUS naphthenic oil) | 40.0 | 40.0 |
| Polartech® EA 700 (polymeric emulsifier) | 7.0 | 7.0 |
| Altapyne® M-28B (high rosin tall oil fatty acids) | 2.0 | 2.0 |
| Hostagliss L4 (Clariant) | 3.0 | 3.0 |
| AE-43 (ACC) | 3.0 | 3.0 |
| TAS SOL EM-8 (ACC) | 4.0 | 4.0 |
| AKYPOTEC AM (ether carboxylate; KAO) | 1.5 | 1.5 |
| Rhodafac® AS-010 (aluminum stain inhibitor; Solvay) | 0.75 | 0.75 |
| OPP 40% in glycol (fungicide; Lanxess) | 3.75 | 3.75 |
| MIPA (Dow) | 2.0 | --- |
| TEA 99-LFG (Dow) | 5.0 | --- |
| Synergex LA (Eastman) | --- | 3.0 |
| Amietol M12 (Eastman) | --- | 5.0 |
| Cola®Cor 232 (corrosion inhibitor blend; Colonial) | 4.0 | 4.0 |
| Cola®Cor RP (amine borate; Colonial) | 4.0 | 4.0 |
| DI water | 18.75 | 17.75 |
| TT-50 (sodium tolyltriazole 50%) | 0.5 | 0.5 |
| Propylene glycol | 1.0 | 1.0 |

Improved cast-iron chip corrosion protection

405A

405B

Synergex
LA/MDEA



2%

3%

4%

Reduced foaming profile

405A

405B



Synergex LA/MDEA

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Reduced foaming profile

405A

405B



Synergex LA/MDEA

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Use Synergex LA to replace DCHA? Drop in?

DCHA (CAS 101-83-7)

- Molecular weight: 181.32
- Color water white
- Odor: alkylamine
- Flash point: 96°C (205°F)
- Oil soluble

Synergex LA

- Molecular weight: 173.3
- Color: water white
- Odor: alkylamine
- Flash point: 96°C (205°F)
- HLB = < 10

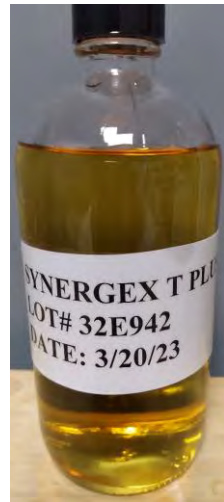
Conclusion/summary on Synergex LA

- Can offer improved concentrate and emulsion stability due to its hydrophilic-lipophilic structure
- Easy to incorporate into typical metalworking fluid formulations
- Cast-iron chip corrosion protection can be enhanced with Synergex LA.
- Similar physical properties as DCHA; replacing secondary amine with a tertiary amine
- Improved odor vs. DCHA
- DCHA >> Synergex LA as far as biosynergy

Synergex T Plus — its back!

Synergex T Plus

- Molecular weight: 217 g/mol
- Color: yellowish+
- Odor: very mild amine odor
- Vapor pressure $\ll 0.01$
- Boiling point: $> 330^{\circ}\text{C}$
- Flash point $> 148^{\circ}\text{C}$
- HLB = 10



Longer chain amino-alcohol — tertiary amine

Not cheap — niche applications or alternative to CORRGUARD™ Ext

Testing done in a semi-synthetic — amines used at 3.5%

- Ease of use/substitution **+** “drop in”
- Coolant odor **++**
- Cast iron chip **-**
- Al staining **+**
- Foaming **+**
- Hard water stability **-**
- Biostability: TBD
- Pricing **==**



Conclusion/summary

→ Synergex T and Synergex LA:

- Can solve a variety of problems
- Are high-performing multifunctional amine additives
- Deserve your consideration in a wide variety of metalworking fluid formulas
- Manufactured in USA; available globally in bulk, drums and IBCs

→ Synergex T+:

- Is a potential alternative for CORRGUARD™ Ext and other higher value amines in niche applications where price is less of a concern
- Samples and drum quantities available now; REACH-TBD

Distributors around the globe

TCR Industries



USA:

- TCR on West Coast
- Ravago (booth 111) everywhere else in USA

Mexico:

- Micro S.A. de C.V. | Hulequímicos y Especialidades Químicas (www.microhulequimicos.com)



China:

- Smart Oil (www.smart-oil.com)



Brazil:

- Braschemical



DACH:

- GB Chemie

Thank you!

Questions?

[Synergex Multifunctional Amine Additives | Eastman](#)

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