

EASTMAN

Eastman **GEM**[™]

2-ethylhexyl palmitate

for skin care and color cosmetics



Redefining sustainable manufacturing

the beauty is in the process

Eastman GEM™ technology is setting a new standard in sustainably manufactured cosmetic ingredients. Eastman GEM 2-ethylhexyl palmitate is manufactured via Eastman's proprietary GEM technology, a process that uses enzymes and closely controlled manufacturing conditions to eliminate high temperatures, strong acids, and unwanted by-products, and consumes less energy compared with conventional manufacturing processes. Eastman GEM 2-ethylhexyl palmitate is a high quality material with the added benefit of sustainable manufacturing, guided by the U.S. EPA's Twelve Principles of Green Chemistry. *The beauty is in the process.*

Sustainable advantages of GEM technology

- Low energy consumption
- Low greenhouse gas emissions
- Minimal waste generated
- No process water consumption
- Adheres to the Twelve Principles of Green Chemistry
- Can utilize natural source materials to produce ingredients

A closer look

Benefits of GEM technology vs. conventional manufacturing

- 52% reduction in CO₂ emissions
- 59% reduction in energy consumption
- 93% waste reduction
- 100% reduction in process water consumed
- E factor of 0.06



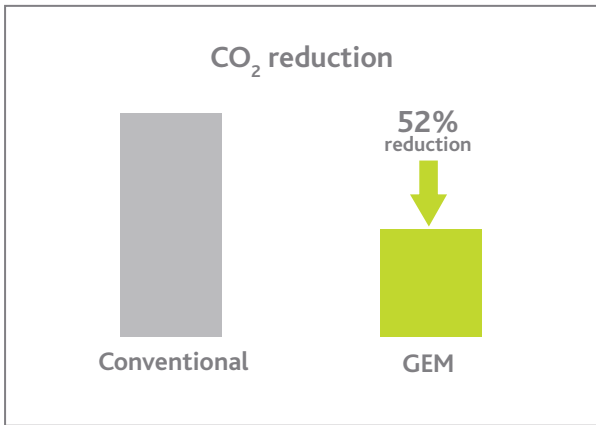
Winner of the 2009 Presidential Green Chemistry Challenge Award*

| Property | Typical |
|--------------------------|---------------|
| Refractive index | 1.4445–1.4465 |
| Specific gravity at 25°C | 0.85–0.865 |
| Saponification value | 150–160 |

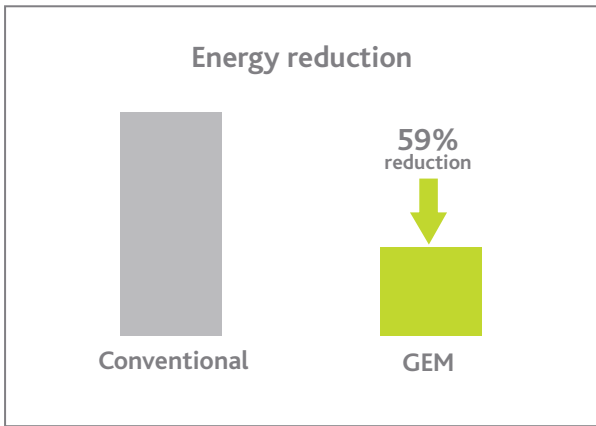
| Property | Specification | Typical |
|--------------------|-------------------------|---------------------------|
| Identity | — | Consistent with structure |
| Appearance | Clear, colorless liquid | Conforms |
| Assay | 95% min. | >98% |
| Acid number | 2 max. | <1.5 |
| Pt-Co (APHA) color | 25 max. | <10 |
| Iodine value | 1 max. | <0.5 |



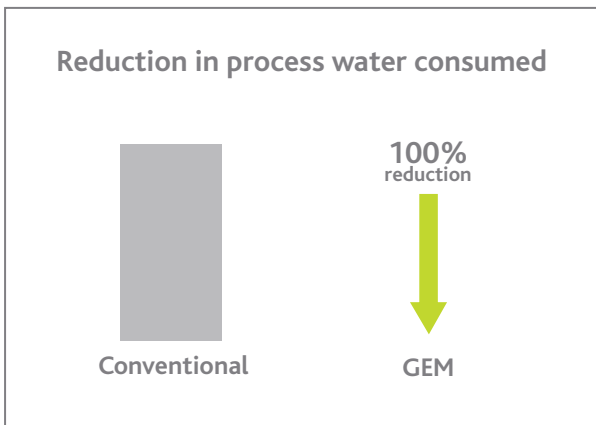
*Eastman GEM™ technology was formerly known as the Eastman green biocatalytic process.



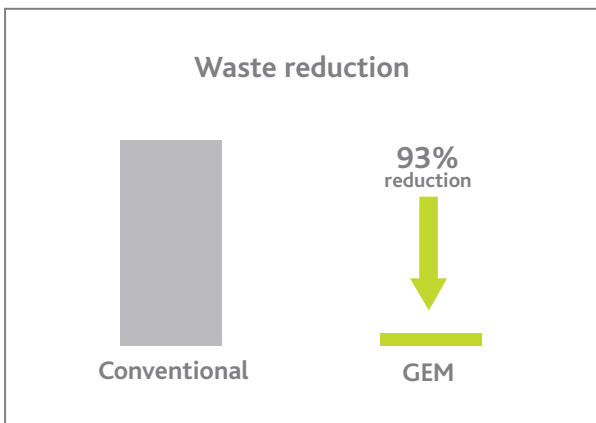
Did you know . . . that compared with conventional processes the 52% reduction in CO₂ emissions with GEM technology to produce 100 metric tons is approximately the same amount of CO₂ emitted from driving a standard sized car 14,400 miles?



Did you know . . . that compared with conventional processes the 59% reduction in energy consumption using GEM technology to produce 100 metric tons is enough to power a standard laundry dryer for 5,900 loads?



Did you know . . . that compared with conventional processes the 100% reduction in process water consumed with GEM technology to produce 100 metric tons is approximately the amount of water contained in 141,000 standard bottles of water?



Did you know . . . that Eastman GEM™ technology can reduce waste by 93% compared with conventional processes?

Data shown is based on a simple process analysis comparing Eastman GEM™ technology to the process described in US patent 6635775 (B1, Example 13). Data is based on a gate-to-gate screening LCA.



The results of insight™

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