Dispersant components

Dispersants consist of two types of component:

- Solvents
- Surface active agents, better known as <u>surfactants</u>

Solvent supply chain

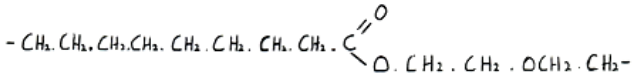
DASIC INTERNATIONAL

Solvents:

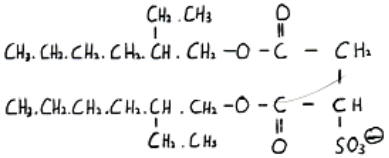
- Lead times for hydrocarbon solvents are now back to pre-pandemic levels
- Lead time for 20 tonne bulk deliveries 5 to 10 days
- US stockpile 5000 m^3 Corexit 9500
- This would require approx 2000 tonnes solvent, which would take a lot longer

Surfactants common to all major dispersants

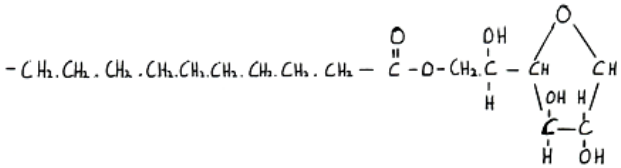
Ethoxylate



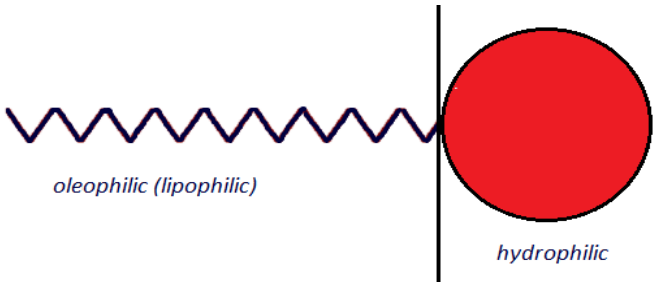
Di octyl sulfosuccinate



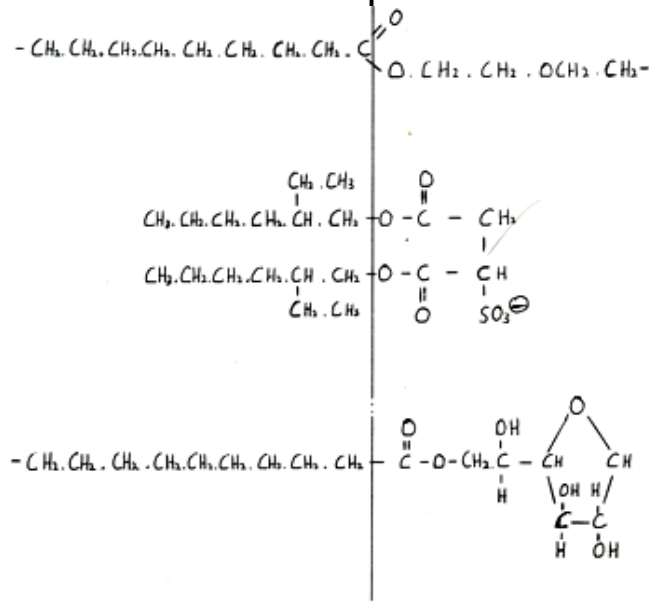
Sorbitan monooleate



Chemistry/mode of action



Fatty acid ethoxylate



Di octyl sulphosuccinate

Sorbitan mono oleate

Surfactant supply chain

DASIC INTERNATIONAL

Surfactants:

- Niche products with complex supply chains and smaller production batches
- Significant plant derived feedstocks
- Sustainability drive causing supply chain pressure due to replacement of petroleum sourced feedstocks with plant derived alternatives

Surfactant supply chain

DASIC INTERNATIONAL

Bloomberg (March 22nd 2023):

"Shortage of Cooking Oil Looms as Biofuels Gain Global Appeal

US, Europe, Brazil and Indonesia are driving the biofuel boom

Palm oil will benefit, but IEA sees impending feedstock crunch"

Surfactant supply chain

DASIC INTERNATIONAL

Sorbitan monooleate (SMO):

- Polynt largest UK supplier SMO
- Polynt unable to supply any SMO since 2021
- Could not supply in 2022 due to global sorbitol feedstock shortage
- Can't now supply until 2024 due to oleic acid shortage (Update October 2023 – Polynt have just started supply again)
- Plant derived feedstock for oleic acid (mainly palm oil)

Surfactant supply chain

DASIC INTERNATIONAL

Sorbitan monooleate (SMO) cont:

- Other suppliers taking up slack
- BUT lead times much longer
- Dasic lead time for 20 tonne lots 6 – 8 weeks (Currently 2 weeks October 2023)
- 5000 m^3 9500 would need ~250 tonnes

Surfactant supply chain

DASIC INTERNATIONAL

Ethoxylated non-ionics:

- Examples Tween 80, Tween 85, ethoxylated fish acid oil
- Made by ethoxylation of fatty acid using ethylene oxide
- Number plants allowed to handle toxic/explosive ethylene oxide has reduced globally due to regulation

Surfactant supply chain

DASIC INTERNATIONAL

Ethoxylated non-ionics cont:

- Croda world's largest producer of Tween 80 and Tween 85 chemistry
- Current maximum global production capacity 60 tonnes/week
- **May** be able to increase production to a maximum of 200 tonnes/week globally but unlikely due to effect on regular customers
- 5000 m^3 Corexit 9500 would need ~1250 tonnes

Surfactant supply chain

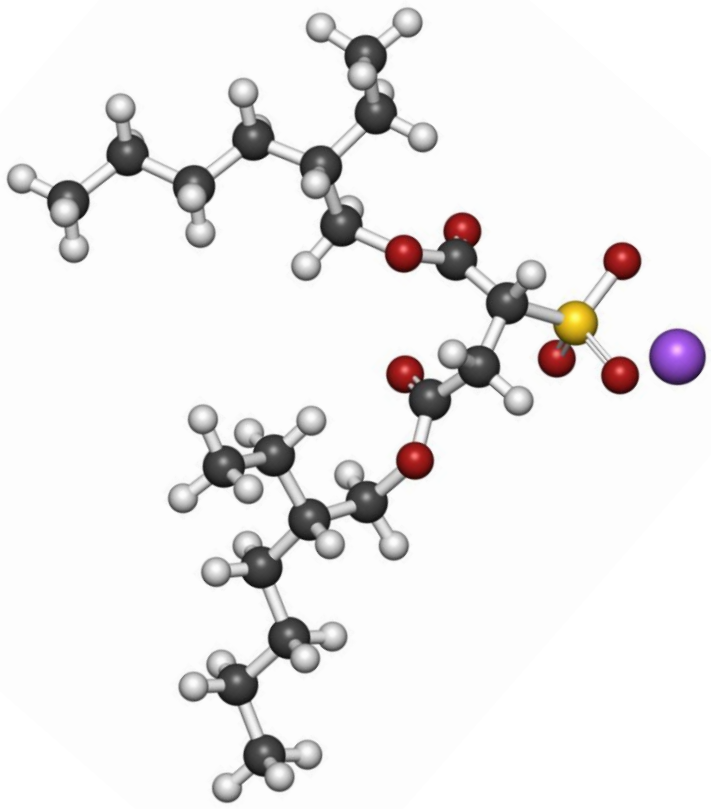
DASIC INTERNATIONAL

Ethoxylated non-ionics update:

- Croda has signed a 5 year agreement with Cargill (its major global competitor)
- This agreement prevents Croda from selling Tween products into the oil industry. Oil spill dispersants are covered by this agreement
- Cargill has exclusive rights to sell Tween for oil industry applications but Croda will still toll manufacture them
- This is not positive for rapid supply
- Croda's European ethoxylation plant currently on 12 week shutdown

Sodium dioctyl sulfosuccinate (Docusate)

Di octyl sulfosuccinate - twin hydrophobic chain makes it highly surface active



DASIC INTERNATIONAL

Sodium dioctyl sulfosuccinate (Docusate)

- Feedstocks maleic anhydride, 2-ethyl hexanol and bisulphite
- Historically, several issues with maleic anhydride availability leading to long lead times
- Current Dasic lead time for 10 tonne lots 6 – 8 weeks (good by historical standards)
- 5000 m^3 9500 would need ~1000 tonnes

DASIC INTERNATIONAL

Sodium dioctyl sulfosuccinate (Docusate)

- Current European production level 10,000 tonnes per annum. (Source: ECHA REACh database)
- Replacing US 5000 m^3 stockpile Corexit 9500 would amount to using 10% of Europe's total annual production
- Macondo exhausted entire global availability Docusate

Packaging and labour supply

DASIC INTERNATIONAL

- Lead time for suitable IBCs (totes) around 2 months
- Labour shortages globally, post pandemic
- BUT Dasic anticipates establishing agreements with toll blending operations in the US and Far East soon

Conclusions

- The concept that dispersant producers can ramp up production to 1000 m^3 plus levels within a few days is not tenable
- Replacing the GDS would take several months, even in ideal supply chain conditions
- Supply failure of one component or feedstock component means no production