New Products for Metalworking and Industrial Lubricants

Ether Carboxylates (II)

Cola®Carb M7C

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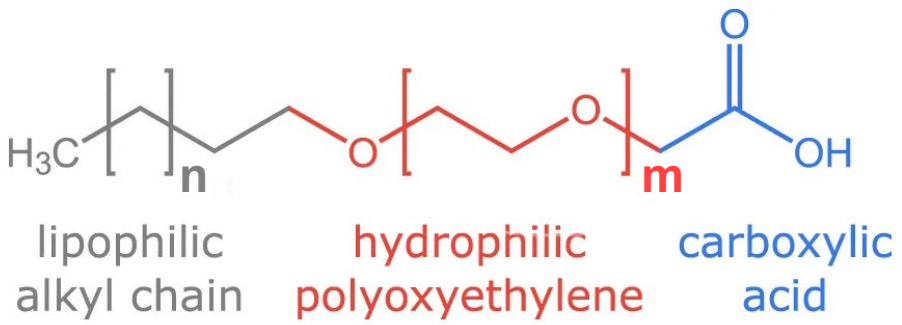
Ether Carboxylates

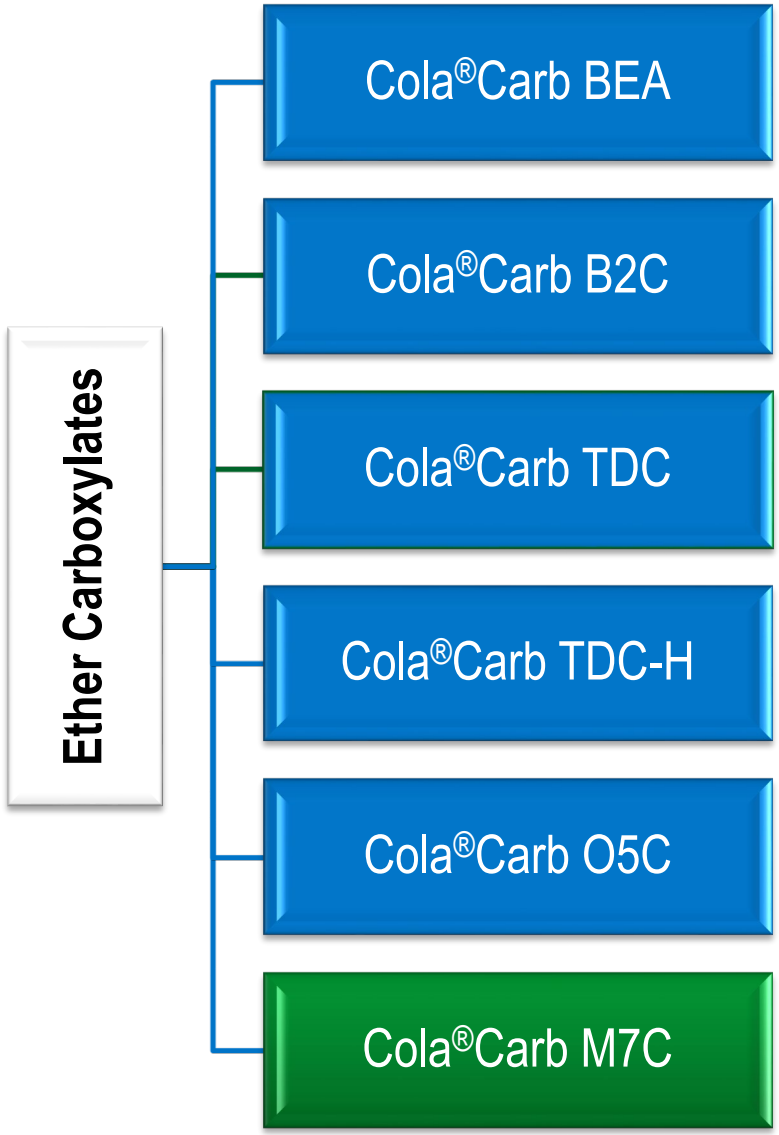


Alkyl Chain: C_4 to C_{18}

Degree of ethoxylation (m): 2 to 10

- Combined nonionic and anionic emulsifiers
- Stable under acidic and alkali conditions (broad pH range)
- Compatible with anionic, cationic, nonionic, or amphoteric
- Structure & performance customizable
- Multifunctional: **EMULSIFICATION**, dispersing, corrosion inhibition, lubrication, wetting, hydroping, coupling, etc.
- Stabilize emulsions against electrolyte and hard water
- Low to medium foaming tendency
- Biodegradable

Previously, Colonial Introduced…



- Short alkyl chain & short EO chain ether carboxylic acid, sodium salt
- Low-foam wetting agent for alkali Cleaners

- Short alkyl chain & short EO chain ether carboxylic acid
- Low foaming wetting agent for alkali Cleaners & MWF

- Medium alkyl chain and medium EO chain
- Hard water stability & optimal lime soap dispersing power
- Cleansing action & the corrosion prevention

- A concentrated version of ColaCarb TDC
- Hard water stability & lime soap dispersing power
- Cleansing action & the corrosion prevention

- Long alkyl chain and medium EO chain
- Low-foam emulsifier; lime-soap dispersing properties
- Electrolyte & hard water stability; cleansing and lubricating; corrosion protection.

NEW

Cola®Carb M7C

- Branched, medium lipophilic alkyl chain
- Moderate to high ethoxylation
- Stable under acidic and alkaline conditions (optimal pH 4 to 10)
- Most often used under the alkaline conditions
- Water soluble upon neutralization
- Primarily serves as emulsifier to form and stabilize emulsions

Cola®Carb M7C

PROPERTY	SPECIFICATION	METHOD
APPEARANCE	CLEAR LIQUID	CCI-0001
pH (1% AQUEOUS)	2.0 – 4.0	CCI-0017
ACID VALUE	70.0 – 85.0	CCI-0068
% MOISTURE	10.0 Max	CCI-0012
COLOR, GARDNER BYK	4.0 Max	CCI-0069
% NaCl	1.0 Max	CCI-0075

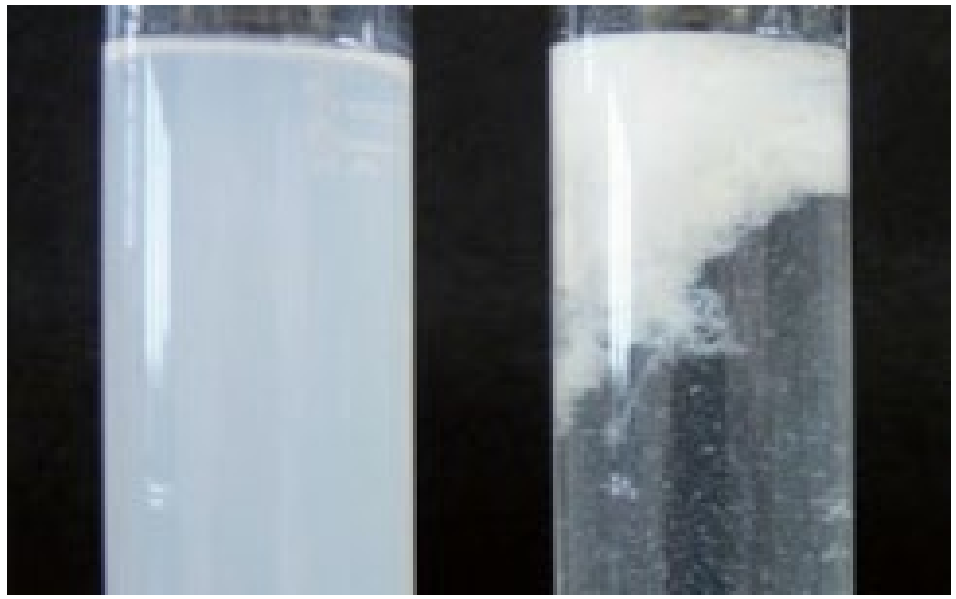
- Clear, pale yellow liquid at ambient temperature
  - *Could turn hazy, opaque, thick, or frozen @ low temperature*
  - *Thaw it slowly at room temperature or 50°C for normal use.*
- Shelf Life: 2 Years

Cola®Carb M7C: Component Evaluation

- HLB = 12
- Surface tension: 35.8 dynes/cm
- Moderate foaming tendency
  - Blender foam Test @ 2 wt% per ASTM 3519
- Moderate corrosion protection
  - ~ 4 wt% to obtain a clean filter paper by ASTM D4627

Cola®Carb M7C: Lime Soap Dispersing Capability

- Expressed as K-Value
- Determined per DIN 53903
  - Mass ratio of calcium oleate to min. dispersing agent
  - Lime soap or calcium oleate formed *in-situ* by sodium oleate and calcium chloride
  - Determining the min. quantity of a surfactant required to produce zero flakes (prior to reaching the condemning point) through a serial dilution study
- Indicates the capability of a dispersing agent to keep the particulates dispersed.
- ColaCarb M7C: **K-Value = 25**



Dispersed

Undispersed
(condemning point)

The Guide Formula: Low Oil, Semi-Synthetic

Ingredient	Wt %
100 SUS naphthenic oil	20.0
Medium molecular weight sodium sulfonate	5.0
Tall oil fatty acids	2.5
ColaLube 3440*	2.5
Alkoxylated alcohol (HLB=10)	3.0
Alkoxylated alcohol (HLB=7)	4.0
Ether Carboxylates*	2.0
Fungicide	1.0
Mono-isopropanol amine (MIPA)	1.2
Triethanolamine (TEA)	0.7
ColaCor 232*	6.0
ColaCor 300*	3.8
Deionized water	41.5
ColaCor RP*	4.8
Bactericide	2.0

*** = Colonial Products**

- Low oil semi-synthetic
- No defoamers added
- In the blend Study, **Ether Carboxylates** replaced by
  - **ColaCarb M7C:** candidate
  - **REF 1**: *an industry reference*
  - **REF 2**: *a medium-foam EC reference*
- Suggested dilution: 5% in tap water (*ca.* 200 ppm)
- Suitable for cutting, forming, etc.
- Suitable for light- to medium-duty machining process for ferrous materials

Concentrates

- Sequentially blended with gentle mixing
- With tap water @ 200ppm
- Clear, brown
- Homogenous

Ref 1 ColaCarb M7C Ref 2

Concentrate Stability Study

- Conducted
  - 4 °C (refrig.)
  - 25 °C (ambient)
  - 50 °C (oven)

- Stable up to 40 days at all temperatures
  - No phase separation
  - No precipitation
  - No creaming

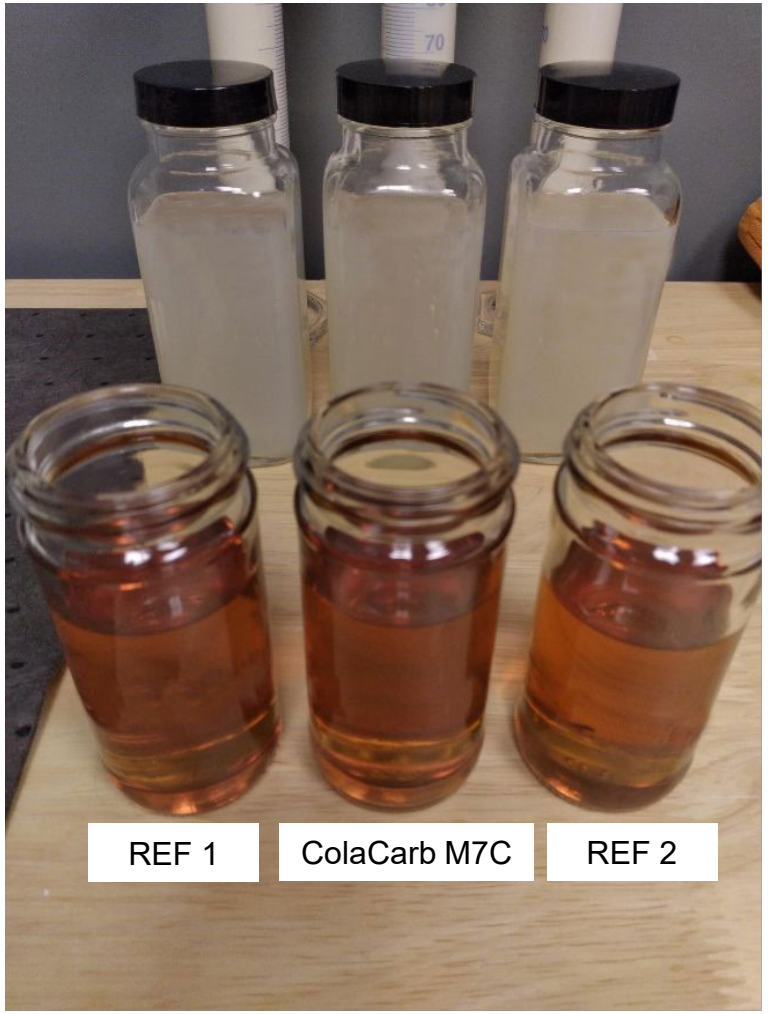
- The room-temperature study is still ongoing for the long-term stability evaluation.

40 days @ 50 °C

REF 1 REF 2 ColaCarb M7C

Work Fluids

- 5 wt% solutions
- Prepared by adding the concentrate to tap water (200 ppm water hardness)
- Translucent emulsions
- Equivalent in the milky appearance by visual inspection



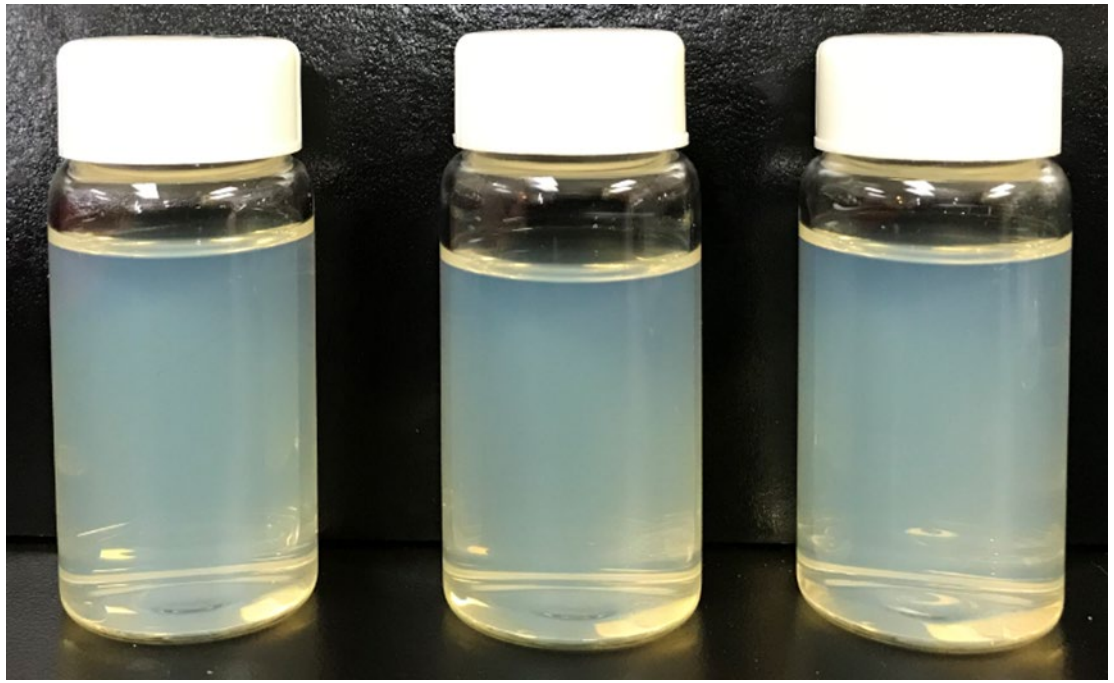
Work Fluids

Concentrates

Stability Study for Working Fluids

- Conducted @ 4 oC (refrig.), 25 oC (ambient), and 50 oC (oven)
- Water hardness: 80 PPM (Colonial local water)
- Stable up to 10 days at all temperature (and going)

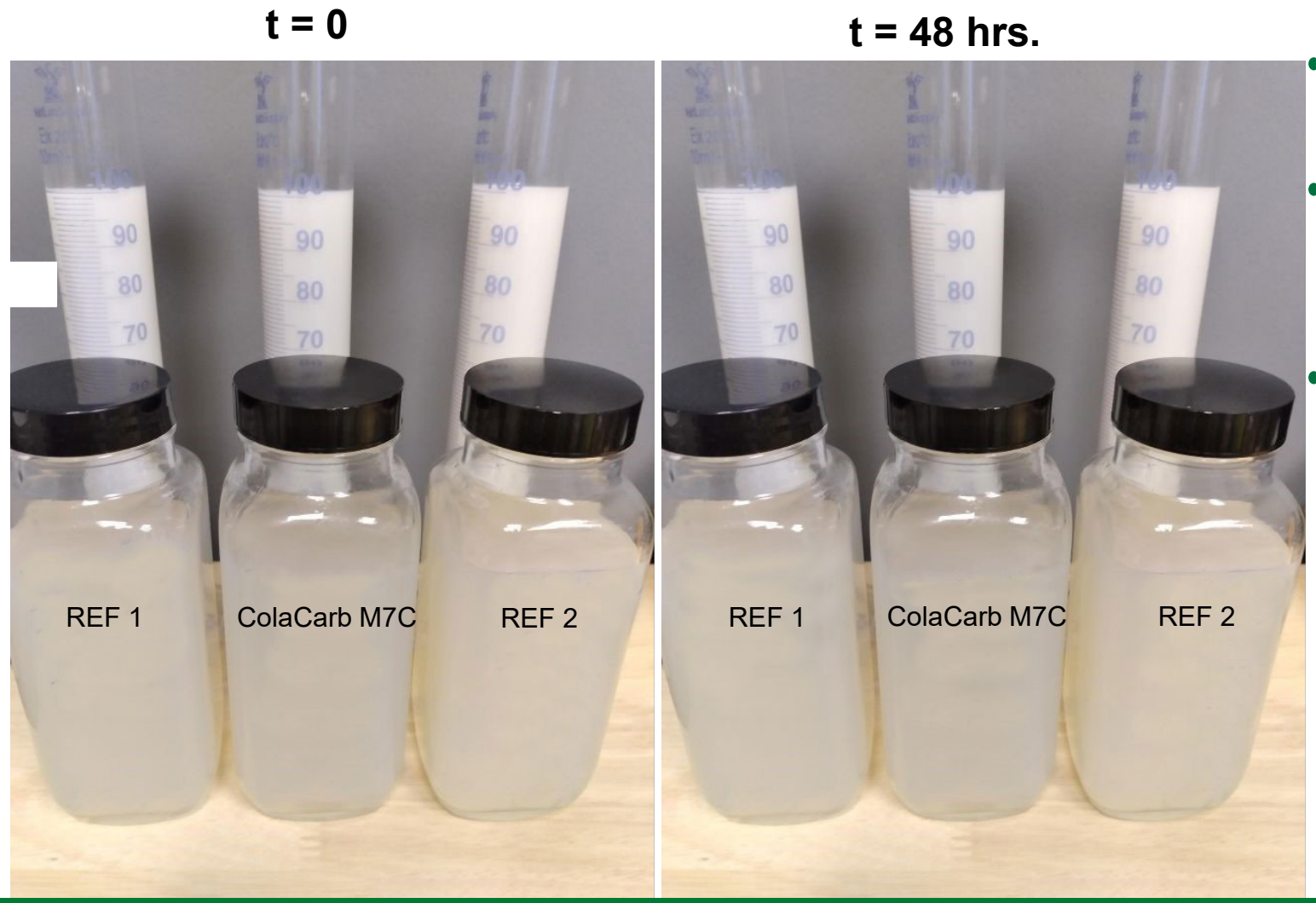
10 days @ 50 °C



REF 1 REF 2 ColaCarb M7C

Cola®Carb M7C offers outstanding emulsification power and rivals competing technology

Hard Water Tolerance



- Water hardness → **650 ppm**
- In general fluids turn more milk-like @ higher water hardness
- At t =0 & 48 hrs, visually inspect on the milky appearance (opaqueness)
  - Less milky = better in hard water tolerance
  - ColaCarb M7C = Reference 1
  - Less than medium-foam EC reference REF2

ColaCarb M7C demonstrates outstanding tolerance toward hard water

Foam Test

- Water hardness: 200 PPM

- Based on an empirical method
  - In-between shake foam test & blender foam test

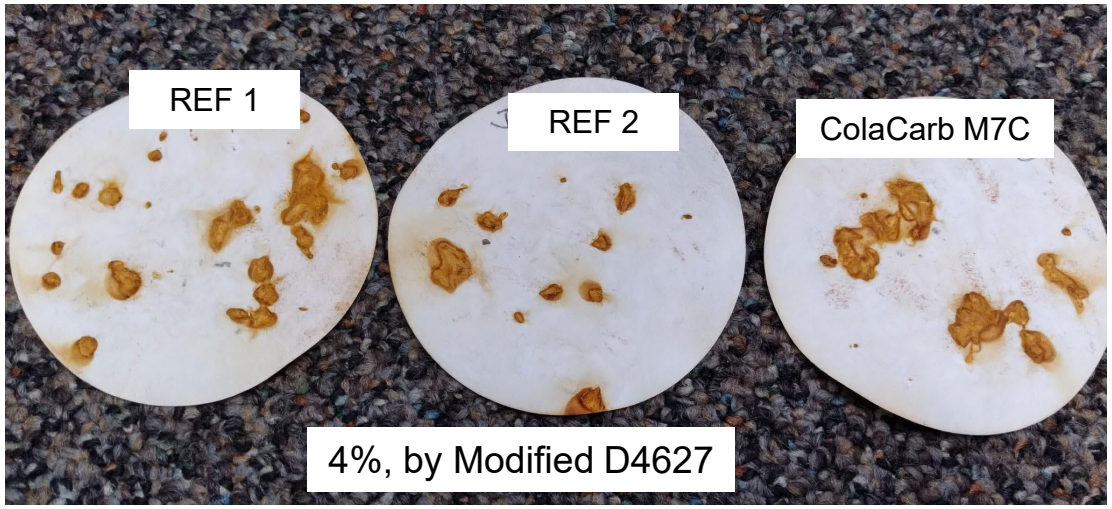
  - Closely mimicking the actual application settings of the fluids

- **ColaCarb M7C shows lower (or at least equivalent) foaming tendency than the competitor's product**

Fluids	Time (seconds) to Reach < 1 cm	
	@ t_0	@ t_{48h}
REF 1	22	22
ColaCarb M7C	20	20
REF 2	23	23

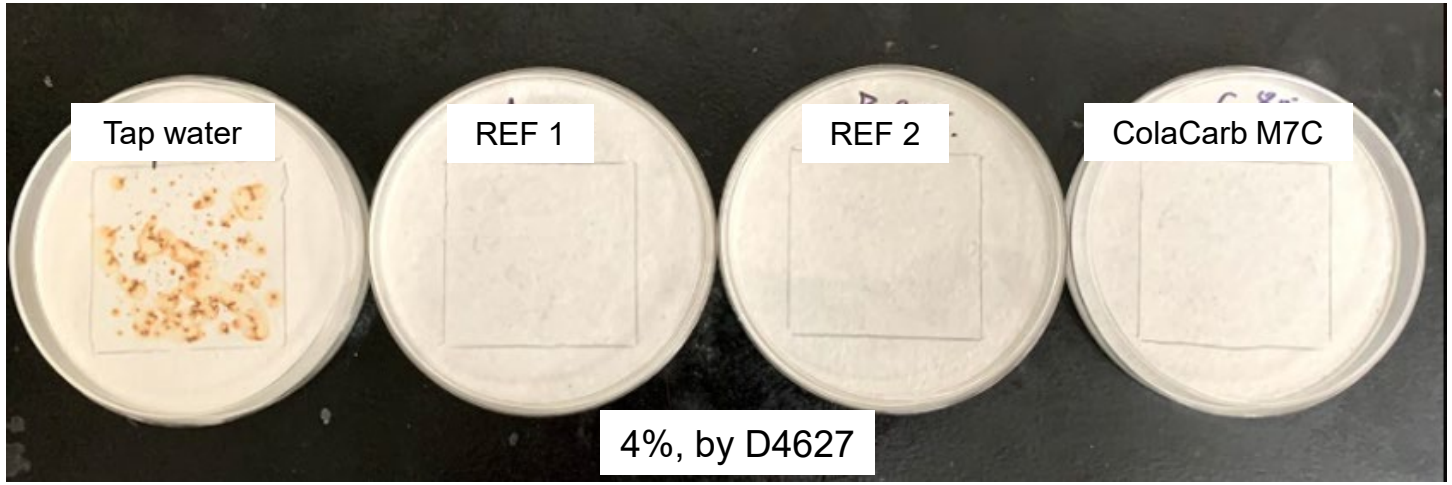
Corrosion

- Two Testing Protocols
  - D4627: 24-hr soaking
  - Modified D4627: with 5-min soaking to mimic the actual MW process



- At 5%: no rusting by either method at both 80 ppm and 200 PPM

- At 4%,
  - Moderate rusting by modified D4627
  - No rusting by D4627



ColaCarb M7C demonstrates equivalent corrosion protection performance to the competing product

Cola®Carb M7C

- Better than the competing product in foaming performance
- Equivalent to the competing product in emulsification capability
- Equivalent to the competing product in corrosion protection

The Performance Augmentation for the Guide Formula

Ingredient	Wt %
100 SUS naphthenic oil	20
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Bactericide	2.0

*** Colonial Product**

- Low oil semi-synthetic
- Baseline formula for low- to medium- duty machining process
- Further Performance Enhancement
  - **ColaLube 3407** to enable the extreme pressure wear protection for heavy-duty machining process
  - **ColaCor KAT** or **ColaCor 215** for aluminum stain inhibition

Key Applications

- Metal working fluids
- Rolling emulsions
- Fire resistant hydraulic fluids (HFA-S)
- Oil & gas
- Mining fluids
- HINI
- Others

Global Registrations

- ✓EU (REACH)
- ✓US (TSCA)
- ✓Canada (DSL)
- ✓Australia (AICS)
- ✓Korea (KECI)
- ✓China (IECSC)
- ✓New Zealand (NZIoC)
- ✓Taiwan (TCSI)

Cola®Carb M7C

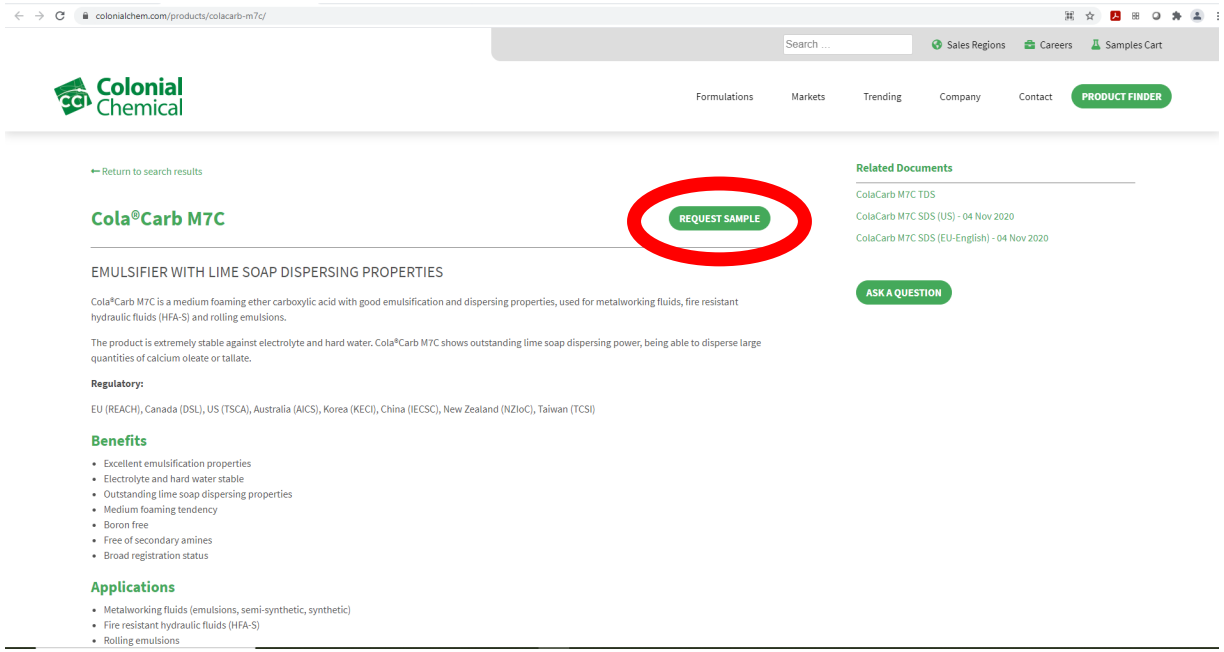
- **Optimal Chemistry**
  - Branched, medium alkyl chain with moderate to high degree of ethoxylation
  - Stable over a broad range of pH
- **Outstanding performance**
  - Good emulsification capability with outstanding lime soap dispersing power
  - High hard water/electrolyte tolerance
  - Supports the corrosion protection
  - Overall rivals or performs better than competitor's product
- **Wide-range applications**: water-dilutable MWF, rolling emulsions, HF, oil & gas, mining fluids, etc..
- **Enhanced Supply Security**
  - Domestically manufactured in US & with a business continuity plan in place
  - Can be readily distributed globally

Info on Cola®Carb M7C

- Pricing Info
  - Contact your territory managers and local distributors

- Technical detail & sample request

https://colonialchem.com/products/colacarb-m7c/



Thank You!
And happy formulating with Cola®Carb M7C!

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Acknowledgement

Customers, Distributors, & External Collaborators

The Colonial team

Stay tuned…