Cola®Cor 186:
A Novel, Potent Carboxylic Acid For Corrosion Protection

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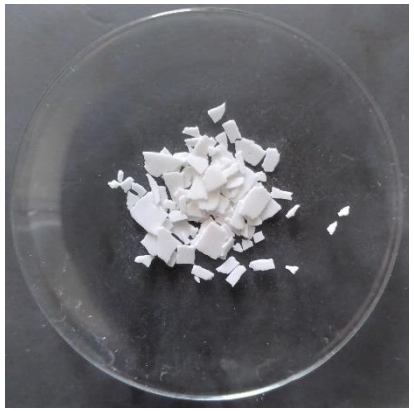
Dibasic Acids: Corfree M1 & Its Replacements

- Corfree M1
  - A by-product from the C12 nylon intermediates
  - Contains C9 to C12 dibasic acids
  - Highly effective water-soluble corrosion inhibitor
  - Widely used in water-dilutable MWF and metal protection fluids and water treatment
  - Discontinued in 2016

- Corfree M1 Replacements
  - Aiming for equivalent corrosion protection
  - Manufactured through different processes
  - Lost the original regulatory coverage for alkanolamine salts
    - Forced changes in the MWF blending process.

Replacement Dibasic Acids 1



Replacement Dibasic Acids 2

Cola®Cor 186: Positioned to Offers Better Performance than Dibasic acids

- An amidocarboxylic acid
- Neat, free, mono carboxylic acid
- Carries a chemical structure with two potential binding sites to the metal surface to mimic the dibasic acid action mechanism for corrosion inhibition.
- It's a liquid or soft solid
  - Low melting point (~ 50 °C vs. ~130 °C for Corfree M1 or its replacements)
- Insoluble in water

Cola®Cor 186	Specifications
Appearance* @ 50°C	Clear Liquid
Color, Gardner BYK @ 50°C	4 MAX
% NaCl	0.1 MAX
Acid Value, mg KOH/g	180 – 205
% Moisture, K.F.	3.0 – 9.0
Solubility (2 GRAMS OF PRODUCT, 2 GRAMS OF TEA, AND 96 GRAMS OF DI Water)	Clear Liquid

ColaCor 186 *vs.* Dibasic Acids

- Evaluation at the level component

- In-formulation Evaluation
  - Based on a high-oil semi-synthetic prototype
  - Handling & blending: **A** vs. **B**
  - Corrosion Comparison: **B/C** *vs.* **D** *vs.* **E**
  - Foam Performance: **B** *vs.* **C**. *vs.* **D**
  - Hard water tolerance: **B** *vs.* **C**. *vs.* **D**
  - Blending process
    - Blend sequentially from top to bottom
    - Apply heat where needed or per design

Ingredients	BL (HOSS)	A	B	C	D	E
100 SUS naphthenic oil (Hygold 100)	48.0	48.0	48.0	48.0	48.0	48.0
ColaLube 3449	6.5	6.5	6.5	6.5	6.5	6.5
High rosin tall oil fatty acids	3.0	3.0	3.0	3.0	3.0	3.0
ColaLube 3440	5.0	5.0	5.0	5.0	5.0	5.0
ColaLube 3430	6.0	6.0	6.0	6.0	6.0	6.0
Colonial A225	4.0	4.0	4.0	4.0	4.0	4.0
ColaCarb O5C	2.0	2.0	2.0	2.0	2.0	2.0
ColaLube 3407	2.5	2.5	2.5	2.5	2.5	2.5
ColaCor IT	1.5					
ColaCor 186			0.5			
ColaCor 186 (premix)				1.5		
Dibasic acids		0.5				
Dibasic acids (premix)					1.5	
Propylene Glycol	2.0	2.0	2.0	2.0	2.0	2.0
ColaCor RP	6.5	6.5	6.5	6.5	6.5	6.5
Triethanolamine 99-LFG	4.5	5.5	5.5	4.5	4.5	5.5
JEFFADD MW-781	1.0	1.0	1.0	1.0	1.0	1.0
Deionized water	6.5	6.5	6.5	6.5	6.5	7.0
Sodium tolytriazole 50%	0.6	0.6	0.6	0.6	0.6	0.6
Densil DG-45	0.35	0.35	0.35	0.35	0.35	0.35
Antifoam (excluded from the foam study)	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*

Handling & Blending: ColaCor 186 vs. dibasic Acids

Dibasic Acids (A)

RT

15-min mixing

50 °C

15-min mixing

ColaCor 186 (B)

RT

15-min mixing

50 °C

15-min mixing

ColaCor 186 can be readily, directly incorporated into blends but dibasic acids cannot

Corrosion Protection for Ferrous Metal at the Component Level

0.5 wt% TEA salts in tap water (70-80 ppm hardness)

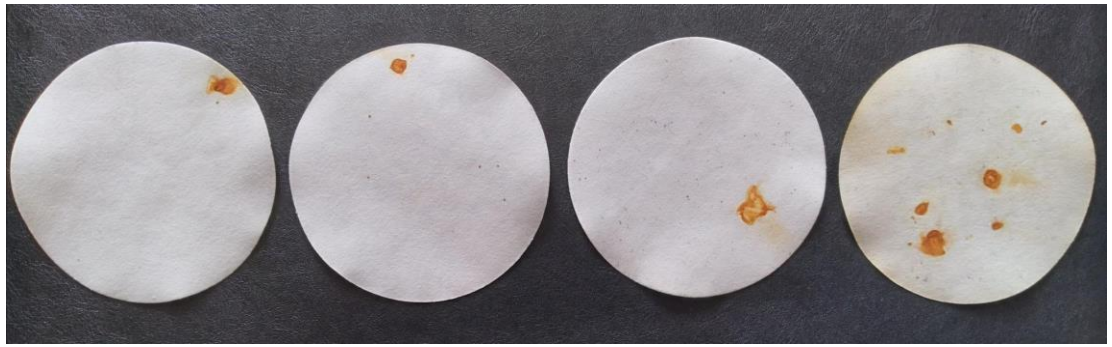
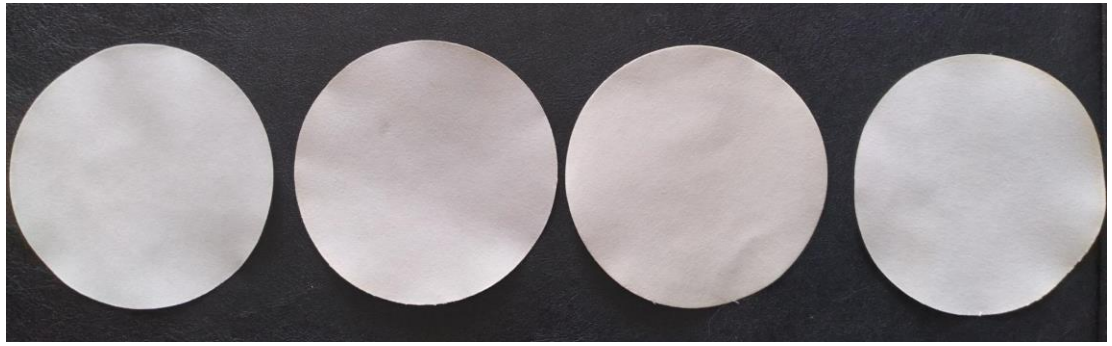
Control (tap water)

Dibasic acids

ColaCor 186

At the component level, ColaCor 186 and dibasic acids are equivalent in ferrous protection

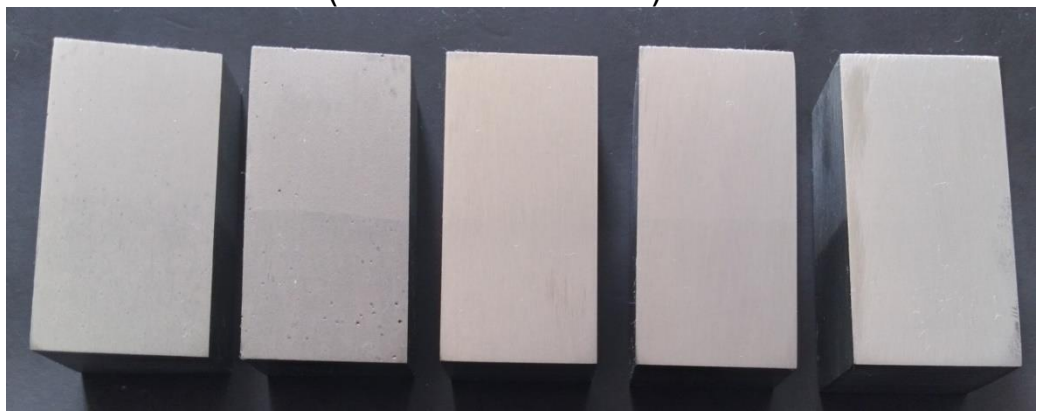
Corrosion Protection for Ferrous Metal: In-formulation Evaluation

	B (ColaCor 186 as is)	C (ColaCor 186 premix)	D (dibasic acids premix)	E (Blank)
2.5% in 150 ppm Water				
5.0% in 150 ppm Water				

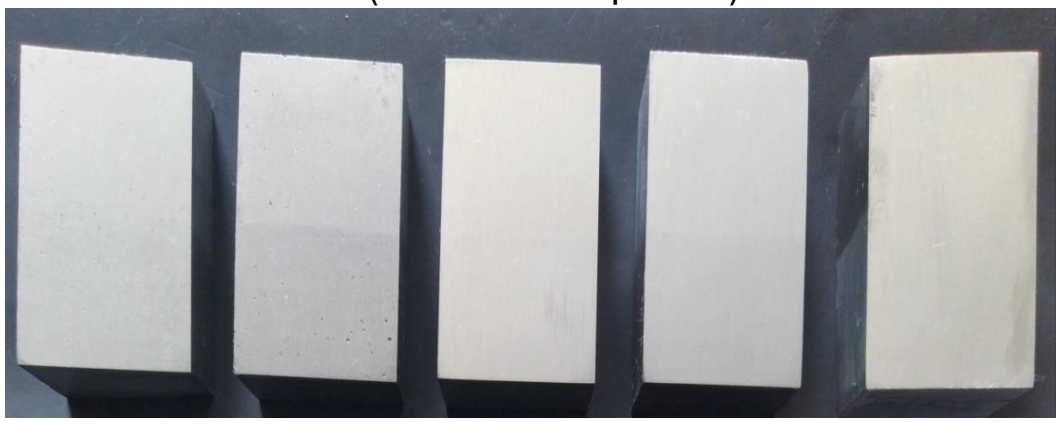
ColaCor 186 and dibasic acids critically contribute equivalent protection for ferrous materials.

Aluminum Staining Prevention: In-formulation Evaluation

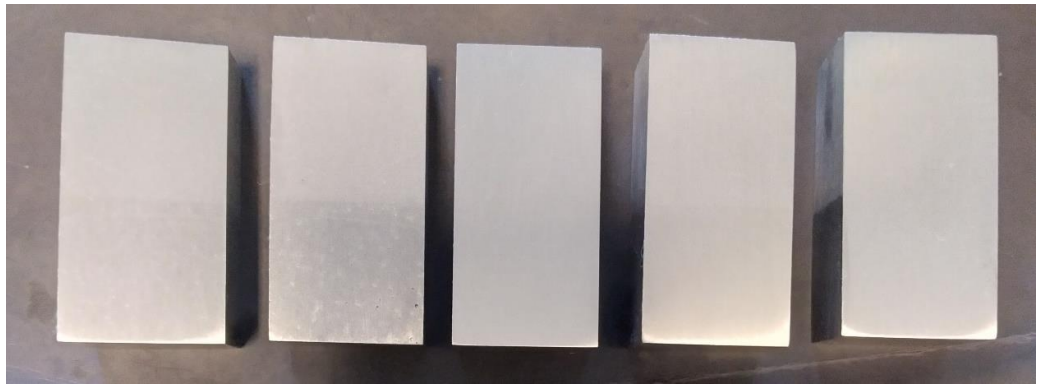
B (ColaCor 186 as is)



C (ColaCor 186 premix)



D (dibasic acids premix)



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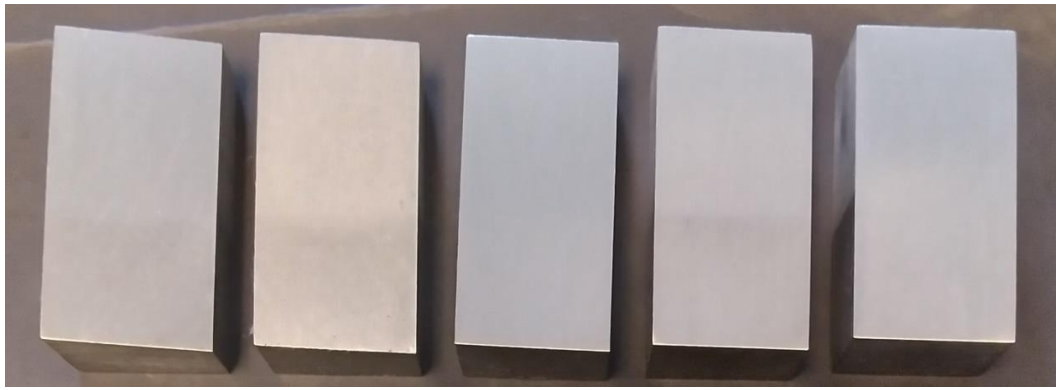
E (blank)



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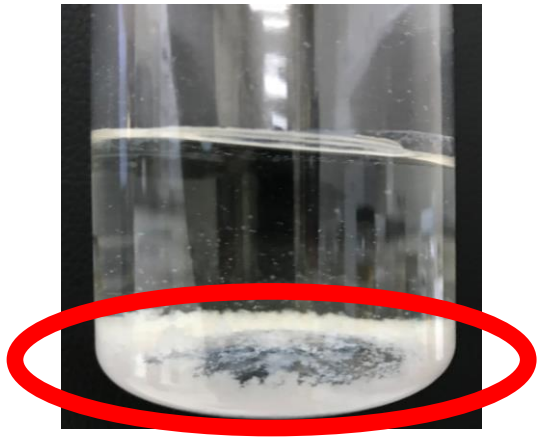
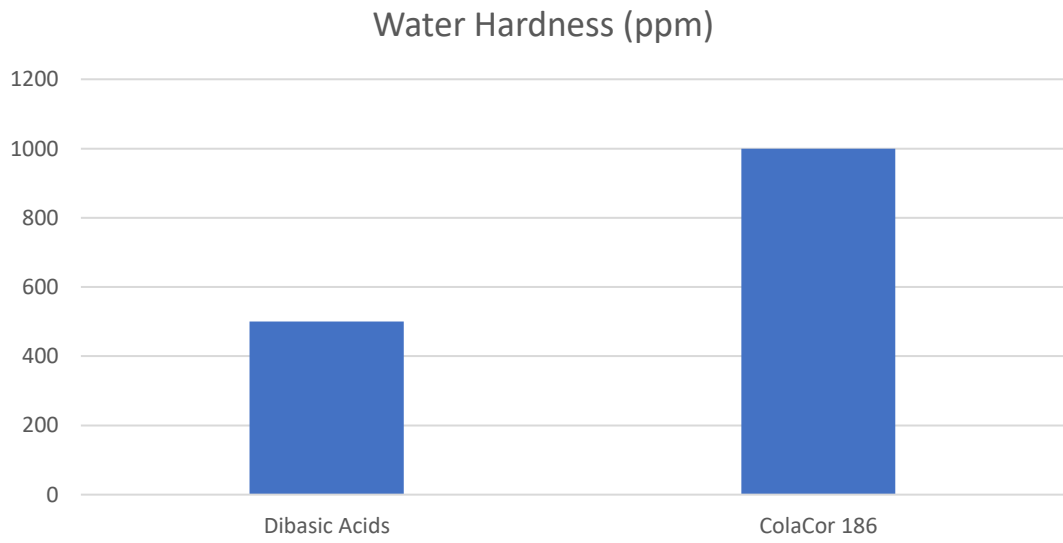
ColaCor 186 appears to be better in aluminum stain prevention than dibasic acids (**D**)

Hard Water Tolerance: ColaCor 186 vs. Dibasic Acids

- Test Method
  - 2% solutions of the TEA salts of ColaCor 186 or dibasic acids
  - Add to the hard water at the designated concentration of $CaCl_2$.
  - Pass/Fail Test
    - No flakes observed after 24 hrs → Pass
    - Flakes observed in 24 hrs → Fail



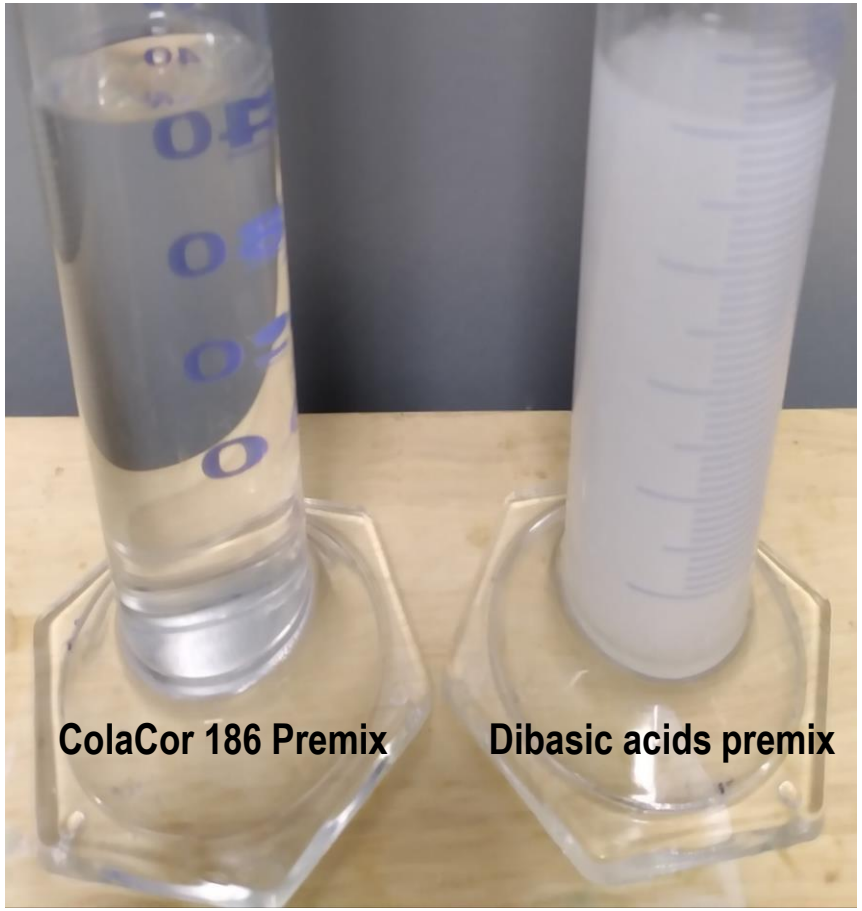
Fail



ColaCor 186 has better hard water tolerance than dibasic acids.

Hard Water Tolerance of Premixes: ColaCor 186 vs. Dibasic Acids

5% Premix at 2000 PPM



ColaCor 186 has better hard water tolerance than dibasic acids

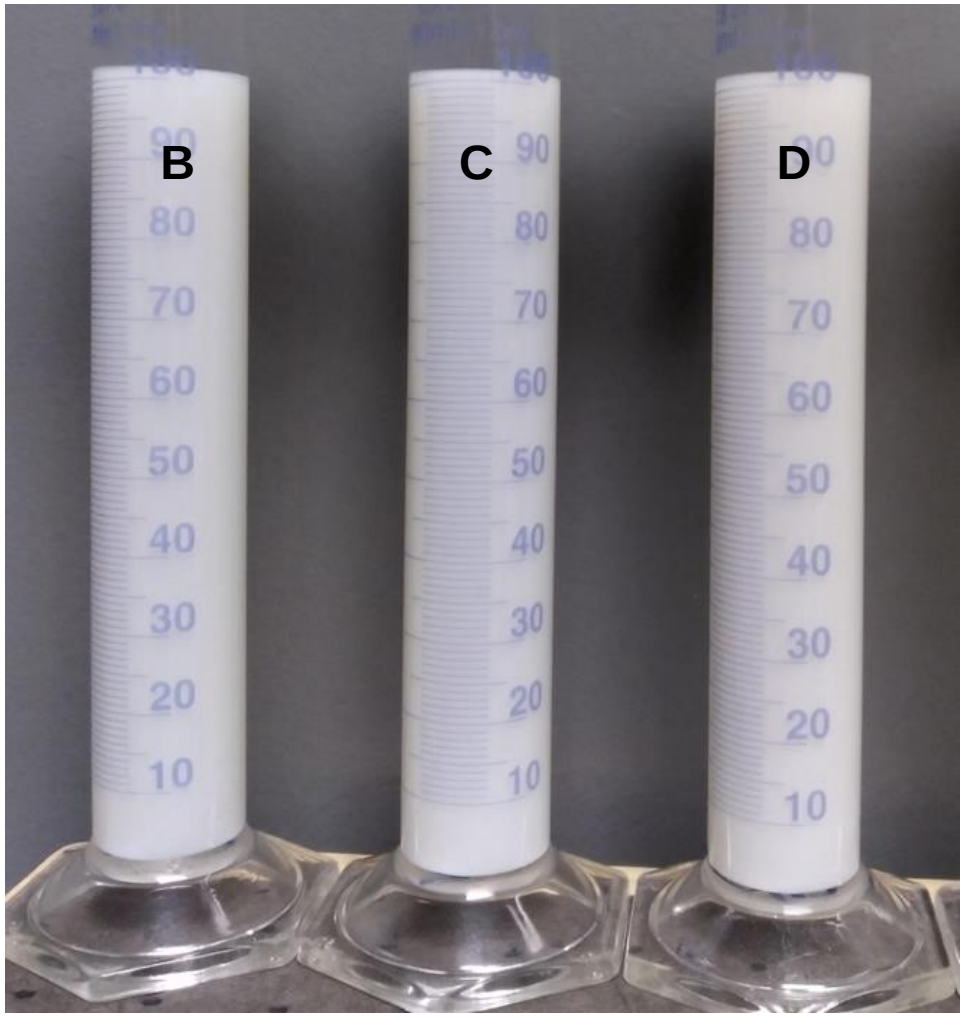
Hard Water Tolerance: In-formulation Evaluation

- 5% dilution of concentrate blends with designated water hardness
  - B (ColaCor 186 as is)
  - C (ColaCor 186 preblend)
  - D (Dibasic acids preblend)

- At 500 ppm & 1000 ppm water hardness, NO differentiation between ColaCor 186 and Dibasic acids in extended studies.

- At 2000ppm, ColaCor 186 premix shows better performance than dibasic acids one.

After 1 week @ 2000 PPM



Foam Performance: at the Component level

- Study
  - Anchored on the premixes
  - 0.5% dilution with tap water
  - Mixed with a food mixer
  - Record time in seconds for foam to completely break.

Fluid	Time to Settle (seconds)
ColaCor 186 premix	14
Dibasic acids premix	5

ColaCor 186 itself shows higher foaming tendency

Foam Performance: In-formulation study, **No AF Added**

- Study
  - NO AF introduced in concentrates
  - 5% dilution with tap water
  - Mixed with a food mixer
  - Pictures taken 2 minutes after mixing

B
(ColaCor 186 as is)

C
(ColaCor 186 premix)

D
(dibasic acids premix)

With no anti-foaming agents, ColaCor 186 shows higher foaming tendency

Foam Performance: In-formulation study, **AF Incorporated**

- Study
  - AF introduced in concentrates
  - 5% dilution with tap water
  - Mixed with a food mixer
  - Time recorded in seconds for foam to completely break.

- Results
  - With AF added, ColaCor 186 shows comparable foam performance to dibasic acid.

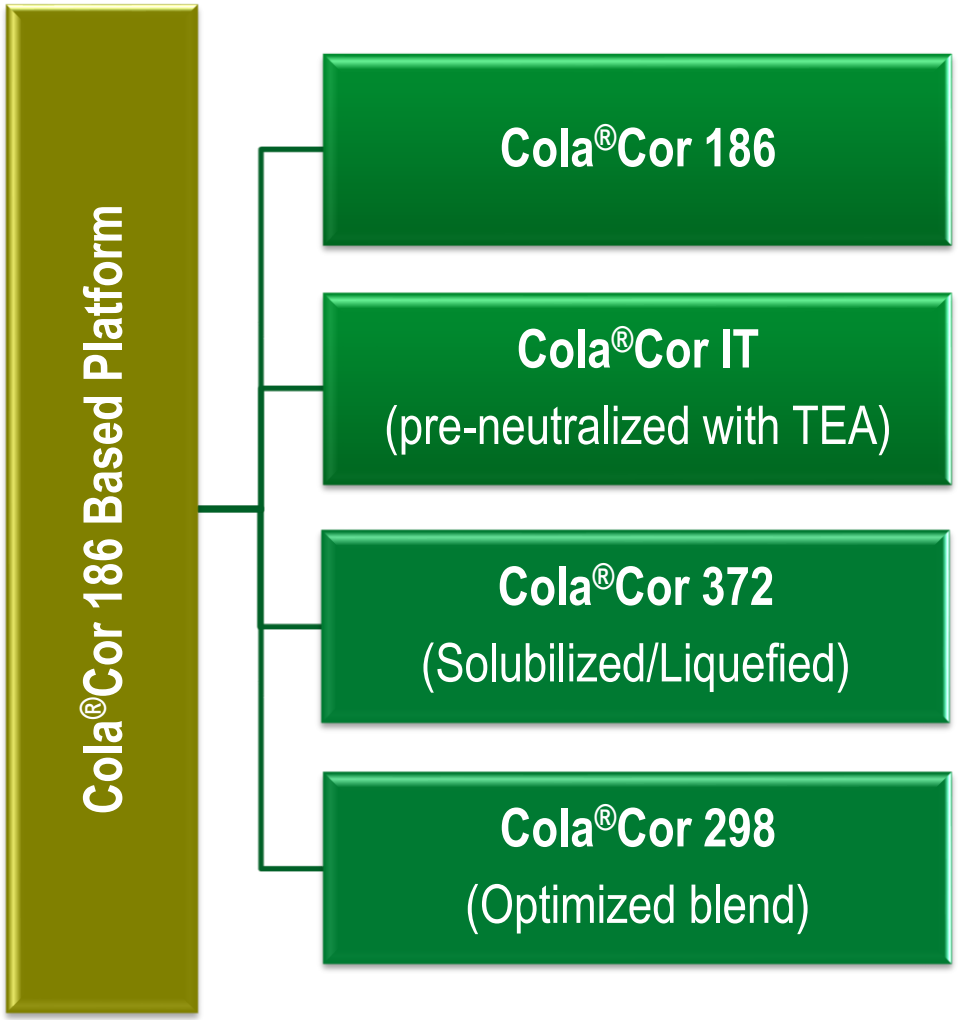
Fluid	Time to Settle (S)
B (ColaCor 186 as is)	25
C (ColaCor 186 premix)	26
D (dibasic acids premix)	22

The ColaCor 186 has higher foaming tendency but can be READILY managed.

ColaCor 186 *vs.* Dibasic acids

Parameter	ColaCor 186	Dibasic Acids
Handling & Blending	+++	+
Ferrous Corrosion Protection	+++	+++
Aluminum Staining Prevention	+++	++
Hard Water Tolerance	+++	+
Foam Performance (w/o AF)	++	+++
Foam Performance (w/ AF)	+++	+++
Application Scope	+++	++
Supply	+++	+

The Corrosion Inhibitor Platform Anchored on ColaCor 186



- Multi-metal corrosion protection
- Outstanding hard water tolerance
- Low to medium foaming
- Broad applications

ColaCor 186: Enables equivalent or Better Performance than Dibasic acids

- Overall ColaCor 186 outperforms Dibasic acids.
- ColaCor 186 provides industry a solution to address the challenges associated with dibasic acids.
- The REACH registration for ColaCor 186 is underway.

The Take-aways

Wherever & whenever dibasic acids is used,

think about what ColaCor 186 can do better & more for you!

Thank You to all collaborators!

For further info:

https://colonialchem.com/products/colacor-186/

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