

Acid Thickening in HI&I Applications

Dr. Andy Sun, Business Manager, HI&I Products



Thickening Methods

1. *Cellulos derivatives:* sodium carboxymethyl cellulose, hydroxyethyl cellulose, methyl hydroxyethyl cellulose, methyl cellulose, hydroxypropylmethyl cellulose, hydroxybutylmethyl cellulose
Disadvantage: hydrolyse on storage and hard to dissolve
2. *Gums:* xanthan gum
Disadvantage: hydrolyse on storage and hard to dissolve
3. *Acrylic acid polymers:* Carbopol (B.F. Goodrich)
Disadvantage: only used in neutral to high pH
4. *Nonionic surfactants:* nonyl phenol ethoxylates
Disadvantage: high usage level
5. *Poly(ethylene oxide):* such as PEG 400, 600, 2000
Disadvantage: high usage level, and instability in some acids
6. *Sodium silicates:* sodium metasilicate.
Disadvantage: takes long time to develop viscosity
7. *Amine based:* tert-amines, alkoxyated amines, amine salts, quats, and combined
Disadvantage: hard to dissolve in water

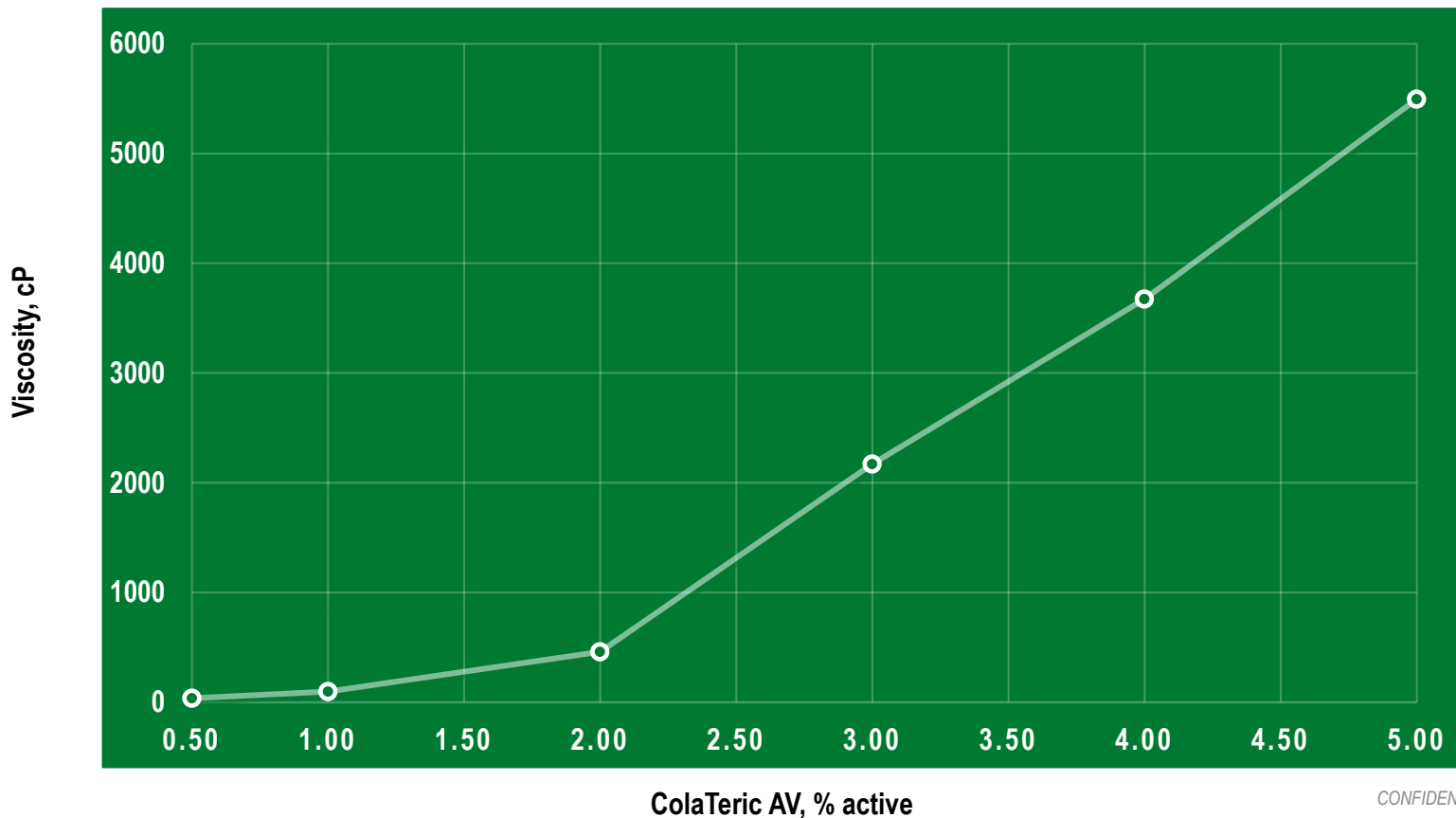
Cola[®]Teric AV

DESCRIPTION: **Amphoteric acid thickener**

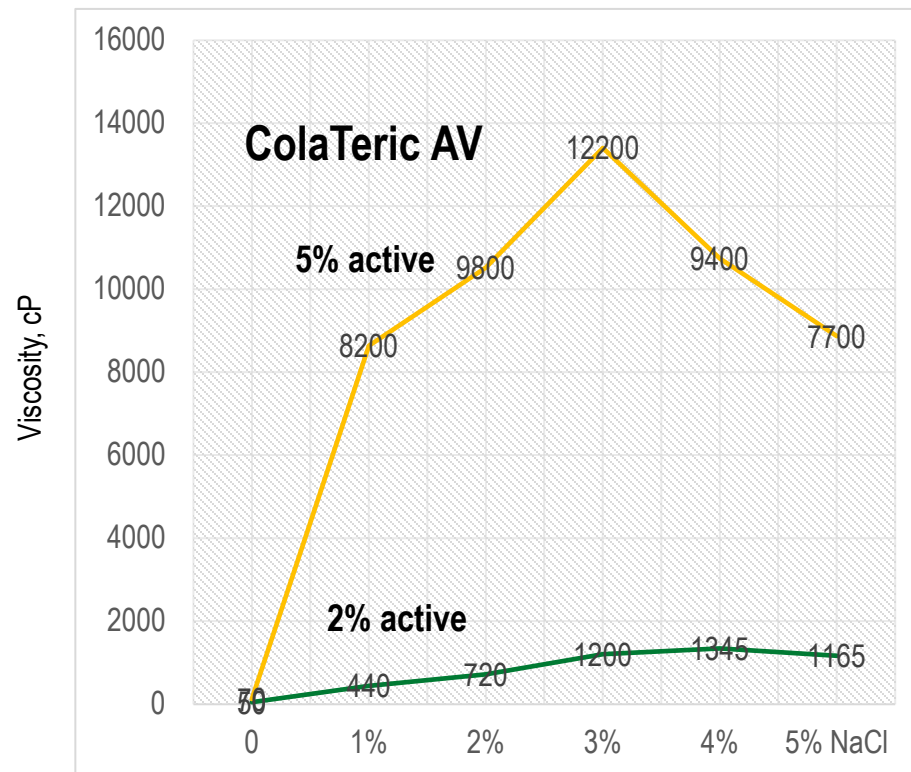
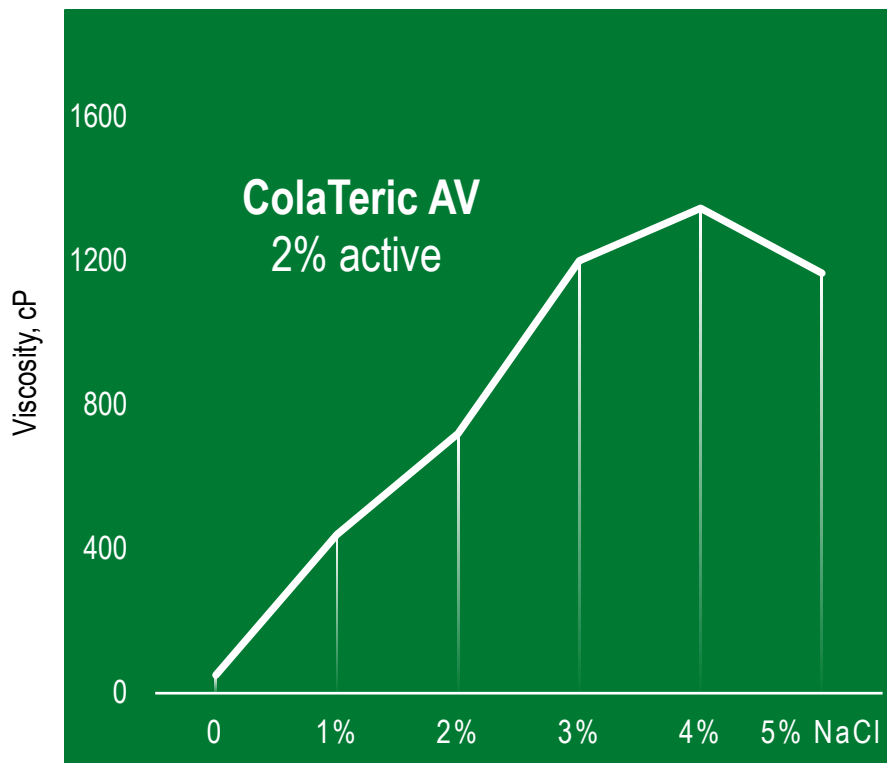
LISTINGS: US (TSCA), Canada (NDSL), China (IECSC), Australia (AICS),
Philippines (PICCS)

| <i>Typical Properties</i> | Cola[®]Teric AV |
|-----------------------------|---------------------------------|
| Appearance, 25°C | Viscous dark amber liquid |
| Solids, % | 39.0 – 43.0 |
| pH (as is @ 25°C) | 4.8 – 5.6 |
| Appearance, 10% aq. | Clear Liquid |
| % Sodium Chloride by weight | 4.6 – 5.4 |

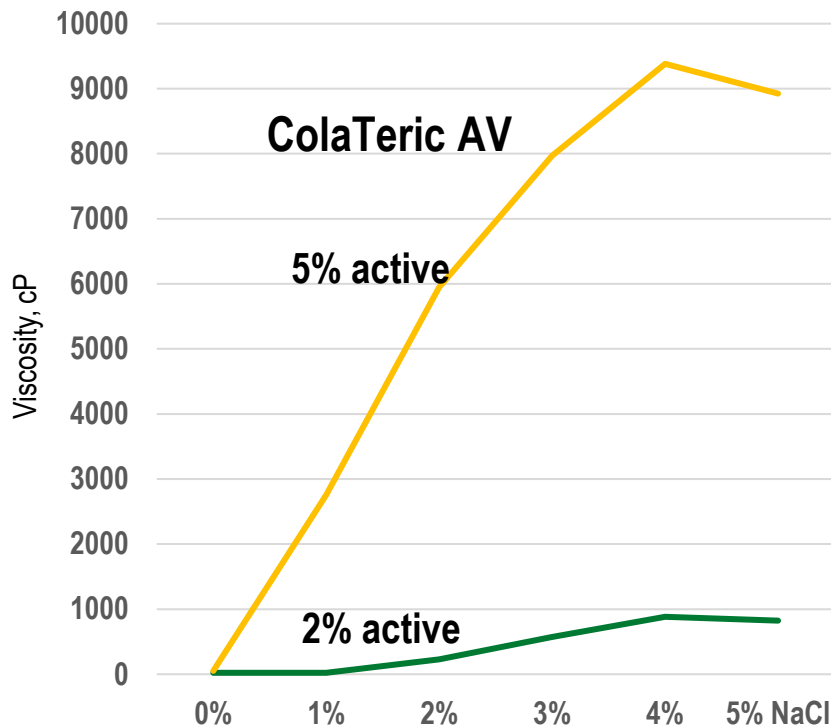
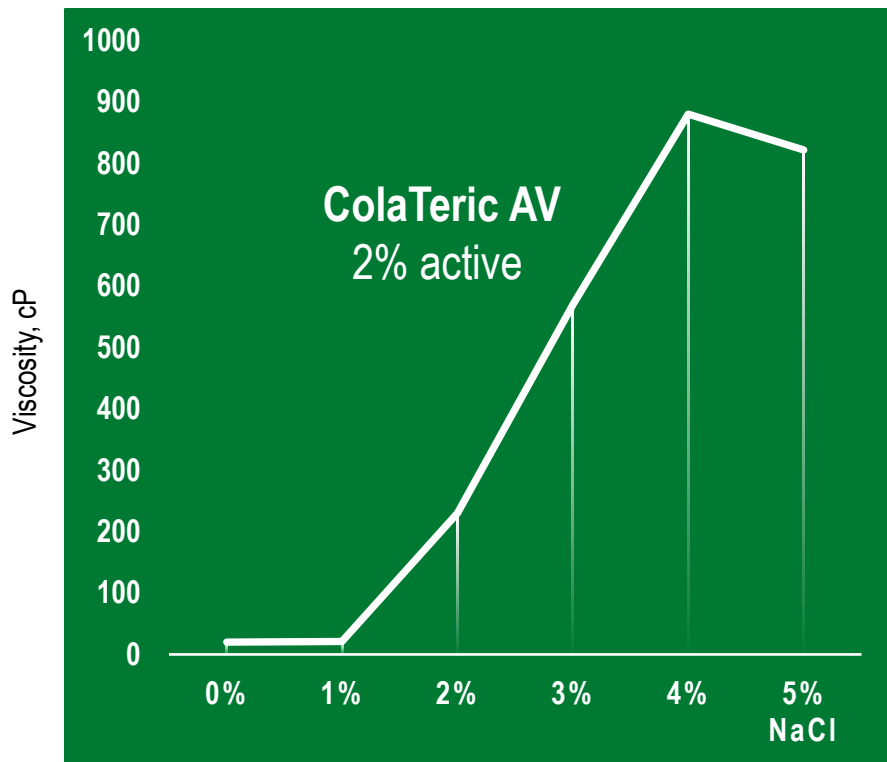
Thickening of 10% (active) Hydrochloride



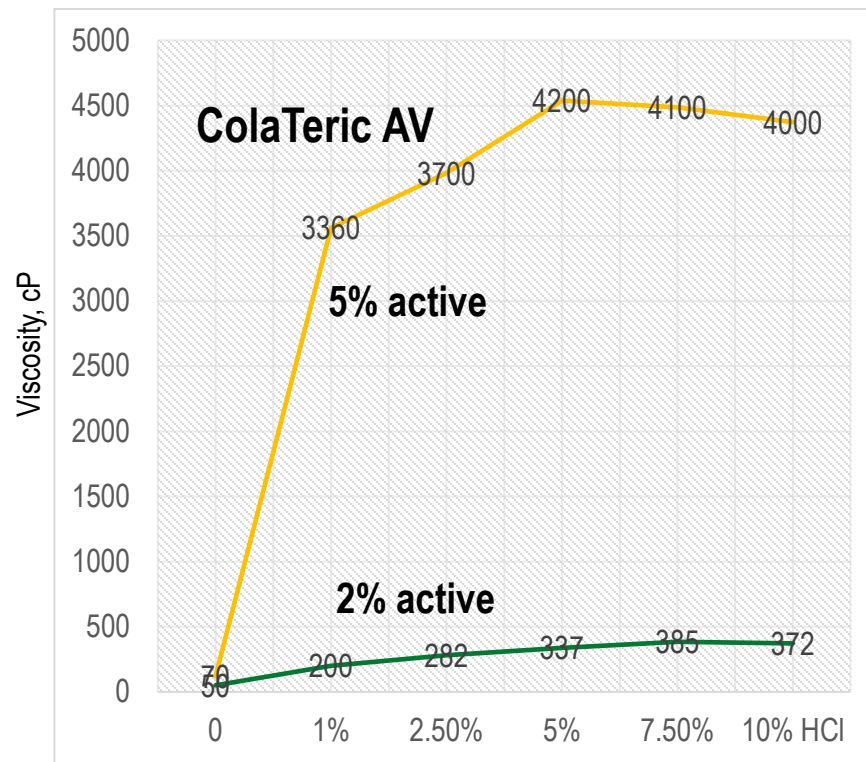
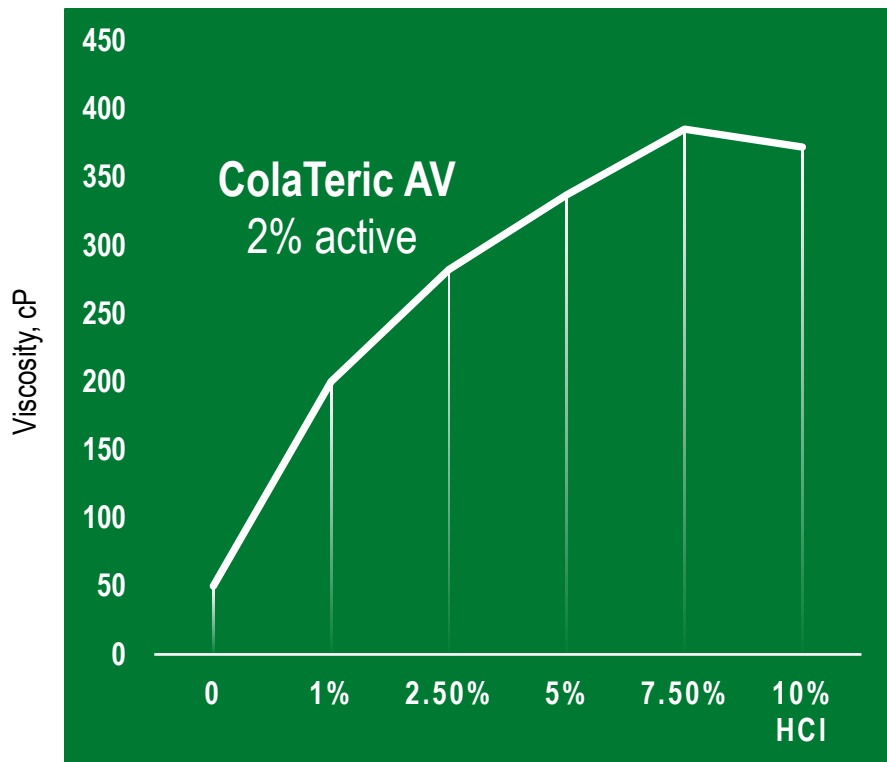
Thickening of 10% Sulfuric Acid with Sodium Chloride



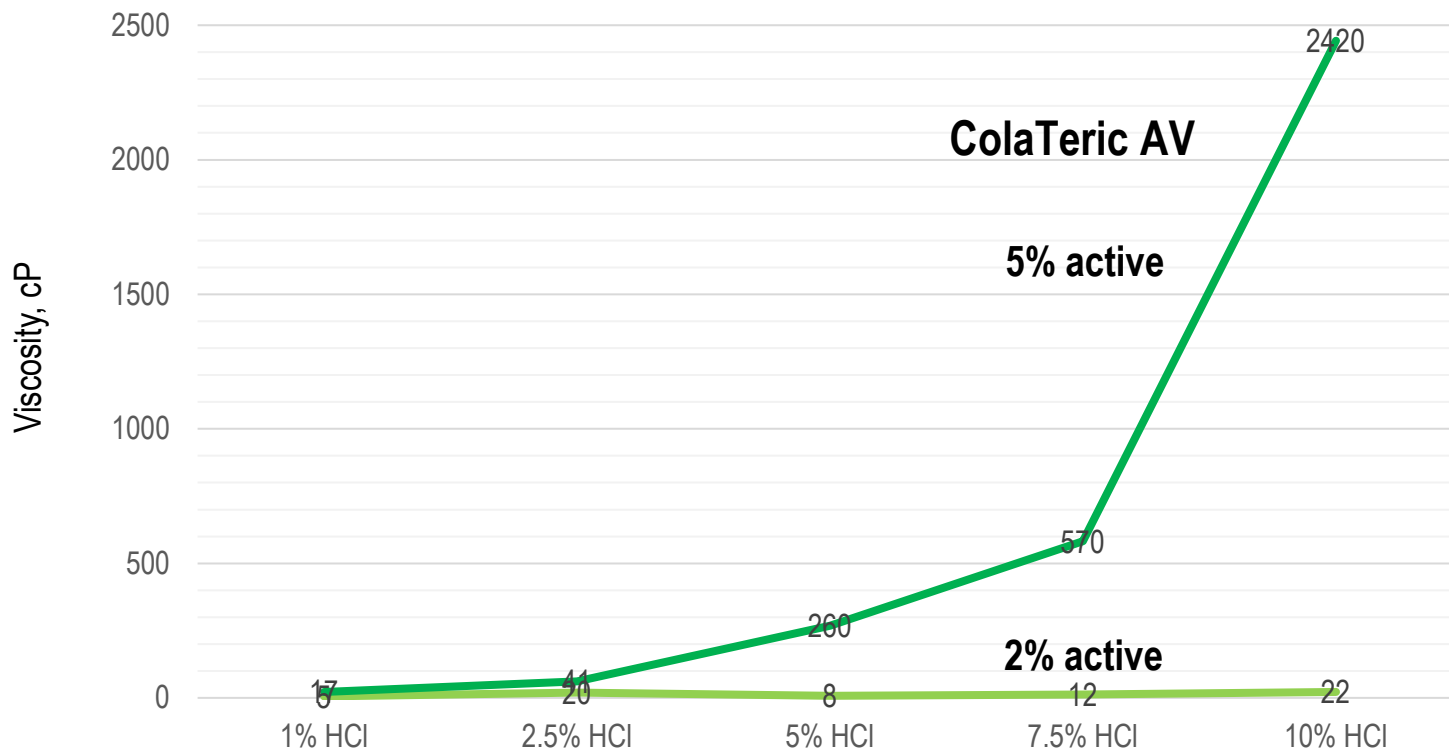
Thickening of 10% Phosphoric Acid with Sodium Chloride



Thickening of 10% Sulfuric Acid with Hydrochloric Acid



Thickening of 10% Phosphoric Acid with Hydrochloric Acid



Formulation of Thickened Acidic Cleaners

| Green Toilet Bowl Cleaner | | No. 5039 |
|----------------------------------|------------------------|--------------|
| | INGREDIENT | % |
| 1 | Water | qs to 100.00 |
| 2 | Cola®Teric AV | 10.70 |
| 3 | Suga®Nate 160NC | 2.00 |
| 4 | Citric Acid, 50% | 16.00 |
| 5 | Sodium Chloride | 9.00 |

Clear to slightly hazy liquid, pH: ~ 1.0, Viscosity: 1950 cP

Combine ingredients 1 – 2. Heat to 35 – 40°C, mix until uniform. Cool to 25°C, add ingredient 3 – 5, mix until uniform.

| Dairy Cleaner | | No. 5040 |
|----------------------|-----------------------|--------------|
| | INGREDIENT | % |
| 1 | Water | qs to 100.00 |
| 2 | Cola®Teric AV | 12.70 |
| 3 | Suga®Boost 030 | 5.00 |
| 4 | Cola®Cor 100 | 1.00 |
| 5 | Citric Acid, 50% | 1.50 |
| 6 | Sodium Chloride | 4.40 |

Clear to slightly hazy liquid, pH: 3.0 – 4.0, Viscosity: 1600 cP

Combine ingredients 1 – 2. Heat to 35 – 40°C, mix until uniform. Cool to 25°C, add ingredient 3 – 6, mix until uniform.

Formulation of Thickened Acidic Cleaners (cont.)

| <i>Acid Transportation Cleaner</i> | | No. 5041 |
|------------------------------------|----------------------|--------------|
| | INGREDIENT | % |
| 1 | Water | qs to 100.00 |
| 2 | Cola®Teric AV | 12.30 |
| 3 | Cola®Dol 900 | 0.50 |
| 4 | Phosphoric Acid, 75% | 12.50 |
| 5 | Sodium Chloride | 3.00 |

Clear to slightly hazy liquid, pH: ~ 1.0, Viscosity: 1950 cP
 Combine ingredients 1 – 2. Heat to 35 – 40°C, mix until uniform. Cool to 25°C, add ingredient 3 – 5, mix until uniform.

| <i>Concrete Truck / Wall Cleaner</i> | | No. 5038 |
|--------------------------------------|----------------------|--------------|
| | INGREDIENT | % |
| 1 | Water | qs to 100.00 |
| 2 | Cola®Teric AV | 12.40 |
| 3 | Cola®Dol 900 | 0.50 |
| 4 | Hydrochloric, 37% | 7.30 |

Clear to slightly hazy liquid, pH as is: ~ 1.0, Viscosity: 2015 cP
 Combine ingredients 1 – 2. Heat to 35 – 40°C, mix until uniform. Cool to 25°C, add ingredient 3 – 4, mix until uniform.

Main Attributes of ColaTeric AV

- Effective thickening of inorganic and organic acids in presence of chloride ions
- Produces long term stable viscosity
- Reduces corrosion of acids to metals cleaned
- Improves wetting, foam, cleaning, and degreasing
- Easy to dissolve in water as compared with amines
- Added benefits in disinfecting



Typical HI&I Applications

- Toilet bowl cleaners
- Dairy cleaning
- Brewery cleaning to remove “beer stone”
- Transportation cleaners
- Metal cleaners and brighteners
- Concrete truck cleaners
- Rust stain removers
- Metal de-scalers in water cooling system
- Denture cleaners
- Oilfield descalers
- Enhances disinfecting





Cola[®]Teric AV

Acid Thickening Agent

LISTINGS US (TSCA), Canada (NDSL), Australia (AICS), China (IECSC), Philippines (PICCS)

Cola[®]Teric AV is an acid thickener that effectively thickens HCl as well as acids, inorganic or organic, in the presence of chloride ions. As a surfactant, Cola[®]Teric AV also provides wetting and detergency properties in acid formulations. Due to its viscosity building efficiency, ease of formulation and long-term stability in mineral acids, Cola[®]Teric AV is ideal for use in acid bowl cleaners, dairy cleaners and a variety of applications where viscous acid solutions are required. For easiest results, add the Cola[®]Teric AV to the water and then add the acids. For acids that don't contain chloride ions, sodium chloride can be added for effective thickening.

FEATURES

- Long term viscosity stability
- Thickens both inorganic and organic acids
- Produces long-term stable viscosity
- Provides corrosion inhibition in acids
- Solubilizes easily and quickly

APPLICATIONS

- Acid bowl cleaners
- Acid truck cleaners
- Building restoration cleaners
- Other vertical surface cleaners
- Dairy cleaners
- Concrete cleaning
- Descaling



SPECIFICATIONS

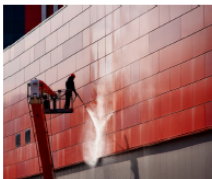
| | |
|----------------------------|--------------|
| Appearance, 25°C | Clear Liquid |
| pH (as is @ 25°C) | 4.8 – 5.6 |
| % Solids | 39.0 – 43.0 |
| % Sodium Chloride (by wt.) | 4.6 – 5.4 |
| % Active (solids-salt) | 33.6 – 38.4 |

THICKENING WITH NaCl

| | 10% Sulfuric | | 10% Phosphoric | |
|---------|--------------|-----------|----------------|-----------|
| | 2% Active | 5% Active | 2% Active | 5% Active |
| 1% NaCl | 440 | 8200 | 21 | 2735 |
| 2% NaCl | 712 | 9800 | 230 | 5720 |
| 3% NaCl | 1200 | 12200 | 570 | 7400 |
| 4% NaCl | 1345 | 9400 | 880 | 8500 |
| 5% NaCl | 1165 | 7700 | 822 | 8100 |

THICKENING WITH HCl

| | 10% Sulfuric | | 10% Phosphoric | |
|----------|--------------|-----------|----------------|-----------|
| | 5% Active | 5% Active | 5% Active | 5% Active |
| 1% HCl | 3360 | 17 | | |
| 2.5% HCl | 3700 | 41 | | |
| 5% HCl | 4200 | 260 | | |
| 7.5% HCl | 4100 | 570 | | |
| 10% HCl | 4000 | 2420 | | |



| Toilet Bowl Cleaner | | No. 5038 | |
|--|--------------|-------------------|---|
| INGREDIENT / INCI | % | INGREDIENT / INCI | % |
| Water | qs to 100.00 | | |
| Cola [®] Teric AV / Tallow Dihydroxyethyl Stearate | 12.40 | | |
| Surf [®] Dial 900 / Ethoxylated fatty alcohol | 0.50 | | |
| Orthochloric Acid, 37% | 7.30 | | |
| o slightly hazy liquid, pH – 1.0, Viscosity: 2015 cP | | | |
| bine ingredients 1 – 2, Heat to 35 – 40°C, mix uniform. Cool to 25°C, add ingredient 3 – 5, mix uniform. | | | |

| Toilet Bowl Cleaner | | No. 5039 | |
|--|--------------|-------------------|---|
| INGREDIENT / INCI | % | INGREDIENT / INCI | % |
| Water | qs to 100.00 | | |
| Cola [®] Teric AV / Tallow Dihydroxyethyl Stearate | 10.70 | | |
| Surf [®] Wate 160WC / Sodium Decylglucosyl Hydroxypropylsulfonate | 2.00 | | |
| TRIC ACID, 50% | 16.00 | | |
| odium Chloride | 9.00 | | |
| o slightly hazy liquid, pH – 1.0, Viscosity: 1950 cP | | | |
| bine ingredients 1 – 2, Heat to 35 – 40°C, mix uniform. Cool to 25°C, add ingredient 3 – 5, mix uniform. | | | |



| Dairy Cleaner | | No. 5040 | |
|---|--------------|-------------------|---|
| INGREDIENT / INCI | % | INGREDIENT / INCI | % |
| Water | qs to 100.00 | | |
| Cola [®] Teric AV / Tallow Dihydroxyethyl Stearate | 12.20 | | |
| Surf [®] Boost 030 / Functionalized Alkyl Poly Glucosides | 5.00 | | |
| Cola [®] Cor 100 / Amphoteric Corrosion Inhibitor | 1.00 | | |
| TRIC Acid, 50% | 1.50 | | |
| Sodium Chloride | 4.40 | | |
| Clear to slightly hazy liquid, pH: 3.0 – 4.0, Viscosity: 1600 cP | | | |
| Combine ingredients 1 – 2, Heat to 35 – 40°C, mix until uniform. Cool to 25°C, add ingredient 3 – 5, mix until uniform. | | | |

| Acid Transportation Cleaner | | No. 5041 | |
|---|--------------|-------------------|---|
| INGREDIENT / INCI | % | INGREDIENT / INCI | % |
| Water | qs to 100.00 | | |
| Cola [®] Teric AV / Tallow Dihydroxyethyl Stearate | 12.30 | | |
| Surf [®] Dial 900 / Ethoxylated fatty alcohol | 0.50 | | |
| Phosphoric Acid, 75% | 12.50 | | |
| Sodium Chloride | 3.00 | | |
| Clear to slightly hazy liquid, pH – 1.0, Viscosity: 1950 cP | | | |
| Combine ingredients 1 – 2, Heat to 35 – 40°C, mix until uniform. Cool to 25°C, add ingredient 3 – 5, mix until uniform. | | | |

STORAGE AND HANDLING

Cola[®]Teric AV should be stored in closed containers. Shelf life is 24 months from date of manufacture. Cola[®]Teric AV is shipped in 55-gallon open head steel drums, net weight 460 lbs (204.1 kg). Complete Safety Data Sheet may be downloaded at www.colonialchem.com.

Colonial Chemical
 225 Colonial Drive - South Philadelphia, PA 19130
 Phone: 423-837-8800 - Fax: 423-837-3888
www.colonialchem.com
 Innovative Specialty Surfactants

<https://www.colonialchem.com/colateric-av/>

Questions?

Andy Sun, andy.sun@colonialchem.com,

Thank you!

