Tackling the hurdle of viscosifying low pH fluids like toilet bowl cleaners

In the challenging field of formulating effective acidic fluids a new patented solution has become available that will prove to be the enabling technology to balance the properties needed. Since these fluids can contain significant quantities of electrolytes and/or surfactants structuring is not straight forward. The rheological properties need to be optimized to realize ease of dosing, good vertical cling and maintain good rinsability. All of this has to be done in a technically sound way and at great cost performance. This bulletin will provide proof that Betafib® MCF has the ability to deliver this complex performance.

When considering acidic formulations, a range of home and fabric care products come to mind e.g.:

- Fabric softener an intrinsically unstable emulsion containing cationic surfactants
- Bathroom cleaners
- Glass cleaners
- Toilet bowl cleaners

Due to the elevated level of (stronger) acids, it was chosen to focus on demonstrating performance in the harsh environment of toilet bowl cleaners. There's compelling evidence that Betafib MCF is an enabling technology in the other fields and these will be subject of upcoming bulletins.

This bulletin will provide proof of performance in the following fields:

- Compatibility with various acids at use levels of 5 to 10% percent active
- 12 week stability under cooled, ambient and elevated temperatures (4/20/40 degrees Celsius – 39/68/104 degrees Fahrenheit)
- Ease of dosing of the various formulations
- Ease of rinsability
- Overall aesthetics
- Efficacy of scale removal

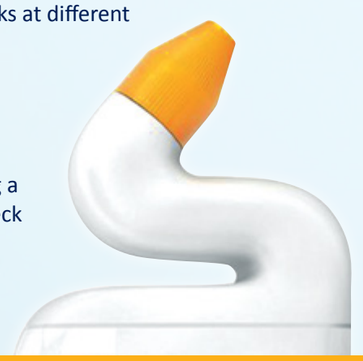
Following set up was used for the evaluation:

A. Preparation

1. Starting with a 1.08% active Betafib MCF slurry
2. Adding 0.6% active SLES
3. Adding the acid at 5% and 9.5/10% active
4. Mixing?

B. Evaluation & comparison against 3 commercial products

1. Measure initial viscosity (using Brookfield equipment)
2. Evaluate stability after aging for 12 weeks at different temperatures
3. Measure viscosity after aging
4. Assess aesthetics
   a. before and
   b. after dying
5. Evaluate ease of application when using a typical toilet bowl bottle with angled neck
6. Evaluate vertical cling
7. Evaluate rinsability after 2 flushings
8. Evaluate efficacy of scale removal



Results

The table below offers an overview of the findings

Formulation	Active material	Initial viscosity (mPa.s) "B1"	Final viscosity (mPa.s) "B3"	Appearance "4b"#	Stability after aging "B2"	Ease of application (thickness on surface in mm) "B5"	Vertical cling (evenness of application) "B6"	Rinsability (remaining perentage of application observed) "B7"
A	HCl 5%	260	240	Light translucent	OK	2-3	Even	10%
B	HCl 9.5%	300	260	Light translucent	OK	2-3	Even	10%
C	Lactic acid 5.0%	250	240	Light translucent	OK	2-3	Even	15%
D	Lactic acid 10.0%	280	280	Light translucent	OK	2-3	Even	10%
E	Glycolic acid 5.0%	250	250	Light translucent	OK	1-2	Even	15%
F	Glycolic acid 10.0%	240	250	Light translucent	OK	2-3	Even	15%
G	Gluconic acid 5.0%	180	200	Light translucent	OK	2-3	Even	25%
H	Gluconic acid 10.0%	210	200	Light translucent	OK	1-2	Even	15%
Comm 1*	HCl	800	750	Clear	OK	2-3	Even	55%
Comm 2**	Bleach	1000	N/A	Translucent	Severe syneresis at 40 dec C	2-3	Slightly uneven	65%
Comm 3***	Citric acid	450	420	Clear to light translucent	Slight syneresis	1-2	Even	45%

Note 1 Thickening realized by ethoxylated amines*
*Note 2** thickening realized by mortmorillonite*
*Note 3*** Thickening realized by xanthan gum*
Note 4# All formulations looked perfectly acceptable after dyeing

To get an indication on the efficacy of scale removal, a concise test was done. Here the Comm 1 was compared to formulation B. There are strong indications that the efficacy of the Betafib MCF based formulation B was superior to the commercial product. A possible explanation to this improved scale removal is the unique morphology of Betafib MCF that creates a completely different structure in the fluids.

Wrap up

Formulations with Betafib MCF are very stable over time independent of the percentage or acid used. Viscosity remained constant over the aging period of 12 weeks. Also the stability of the formulations was okay, given the observation that the fluids remained homogeneous, i.e. syneresis or did not occur.

The appearance of the formulations with Betafib MCF would be perfectly comparable to commercially available products and thereby acceptable upon dyeing.

Although the viscosity of the formulations with Betafib MCF was lower than the viscosity of the commercial benchmarks, the application itself and the vertical cling is on par.

The formulations with Betafib MCF will get added consumer appeal with regards to rinsability, since 2 flushes without agitation resulted in an excellent appearance of the toilet bowl.

Overall findings lead to the conclusion that Betafib MCF offers a technical superior solution to the challenge of viscosifying toilet bowl cleaners at great costperformance.

Do you want to find out how Betafib MCF can improve your formulations containing mild or strong acids?
Then please contact us through **www.cosunbiobased.com**
or direct through **sales@cosunbiobased.com**