

# Aspire™ Products

Webinar: August 20, 2020

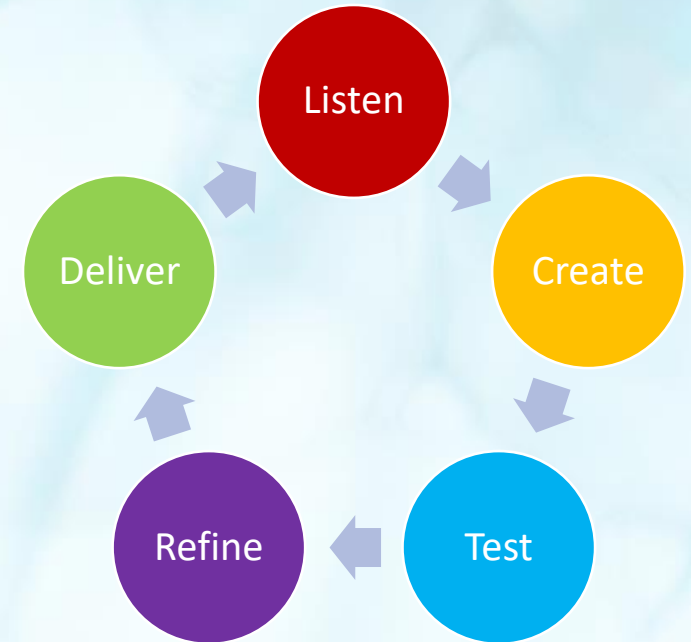
Shoaib Arif  
Colin Horwitz, PhD

## Agenda

- Trends – Meeting the needs
- Aspire™ G Super Concentrate – General purpose formulation ingredient
- Aspire™ BRC Surfactant Blend – Bathroom soap and scum cleaner
- Aspire™ HS Super Concentrate – Hard surface cleaner

## Our customers were telling us their unmet needs

- ✓ “*just add water* high active blends would make formulating easier”
- ✓ “looking for concentrates that are easy to blend”
- ✓ “need to find a way to help us with our sustainability goals”
- ✓ “would love a blend that I can use for more than one product”
- ✓ “commercial surfactants have too much water for the PVOH film products my customers want”



# Market trend - Concentrated products

## Laundry pods – Market size USD 3.6Bn by 2023<sup>1</sup>

- ✓ Decreased packaging
- ✓ Controlled dosing



## Refillable cleaning concentrates

- ✓ Reuse packaging (7 brands as of March 2020)<sup>2</sup>

Unilever<sup>3</sup> - Diluting at home

- 97% less transported water, 87% fewer trucks on the road
- Over 60% say reuse is more important to them than recycling



## Janitorial dispensing cabinet

- ✓ Worker safety – less chemical exposure
  - ✓ Less chemical waste
- 2.8 million potentially exposed janitors<sup>4</sup>

<sup>1</sup><https://www.globenewswire.com/news-release/2019/05/29/1856251/0/en/Laundry-Detergent-Pods-Market-Size-to-Reach-USD-3-567-7-Million-by-2023-at-5-04-CAGR-Predicts-Market-Research-Future.html>

<sup>2</sup><https://www.refinery29.com/en-us/refillable-cleaning-products>

<sup>3</sup><https://www.unilever.com/news/news-and-features/Feature-article/2019/cif-innovation-to-dramatically-cut-plastic-use-and-transport-emissions.html>

<sup>4</sup><https://www.epa.gov/greenerproducts/greening-your-purchase-cleaning-products-guide-federal-purchasers>

# ASPIRE™ G Super Concentrate

Create

- ✓ Minimal processing by starting with surfactants that are ~100% active.
- ✓ Combine cationic and anionic surfactants to form a micellar system with potentially unique properties.
- ✓ Carefully chosen anionic and cationic surfactants in a well-balanced ratio so that they remain miscible in the super concentrated form and when diluted.
- ✓ Employ additional surfactants/ingredients in the blend that work synergistically with the charged surfactants to provide superior cleaning and detergency.
- ✓ Keep it a simple composition.
- ✓ Final product should be easily handled by the formulator and be broadly applicable for HI&I products.

# ASPIRE™ G Super Concentrate

## ***Product Features***

- ✓ **Exceptional cleaning efficacy**
- ✓ **Cost / performance advantageous**
- ✓ **Multifunctional and multiuse**
- ✓ **Simple and easy formulations**

## ***Processable***

- ✓ **Low Viscosity and cold processable**
- ✓ **Readily dilutable with water**
- ✓ **Compatible with common additives**
- ✓ **Color and fragrance customization**

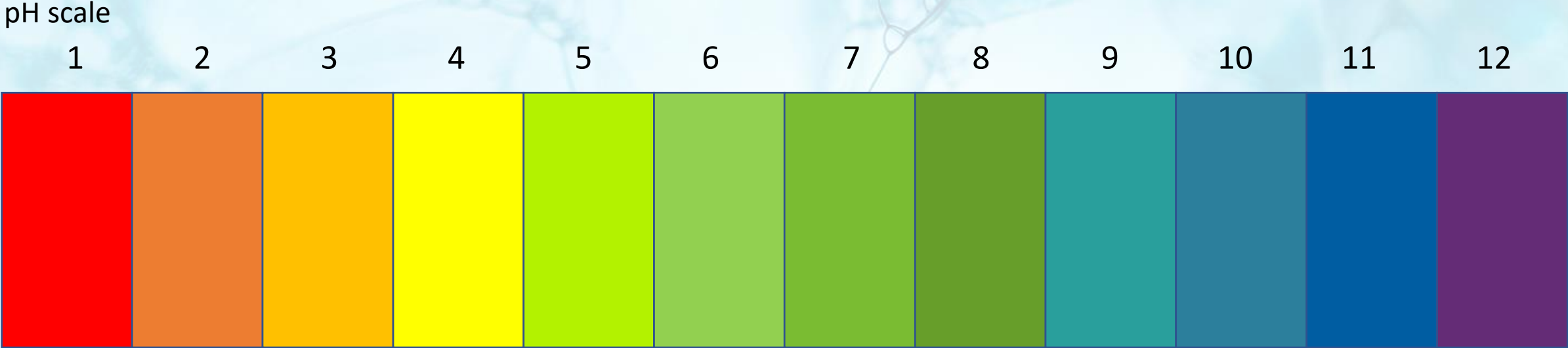
## ***Sustainable***

- ✓ **Biodegradable components**
- ✓ **Fewer trucks on the road**
- ✓ **Low to no odor**
- ✓ **Cost optimization of supply chain & logistics**
- ✓ **Warehouse space savings**



# Cleaners

Aspire™ G Super Concentrate formulates across the pH spectrum



✓ Bathroom

- Floor cleaner
- Acidic car wash

❖ Dish soap

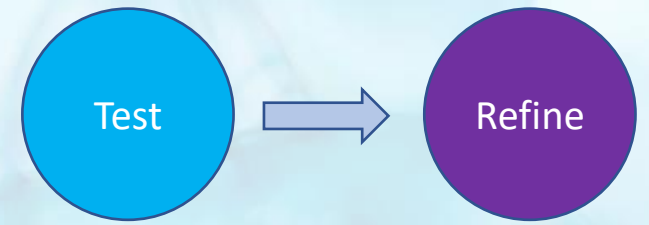
- ❖ Liquid laundry
  - ✓ Economy
  - ✓ mid-tier
  - ✓ premium

- ❖ Greasy hard surface
  - Glass cleaner

❖ Pods

- ✓ Evaluated by Pilot
- Evaluated by customer
- ❖ Evaluated by Pilot and customer

## Pilot's Testing



### Laundry

#### Modified ASTM D 4265

- Three swatches of 10 different soils on cotton (triplicate verification)
- Top load washer (15 gallons)
- 150 ppm hardness
- T = 90°F
- 12 minute wash cycle
- Performance measured by swatch reflectance analysis - Photovolt 577 Reflectometer / Green Tri-Stimulus Filter

- Clay
- Coffee
- Cran-Grape
- Dust Sebum
- EMPA 112
- EMPA 116
- Grass
- Makeup
- Mud
- Spaghetti



External testing



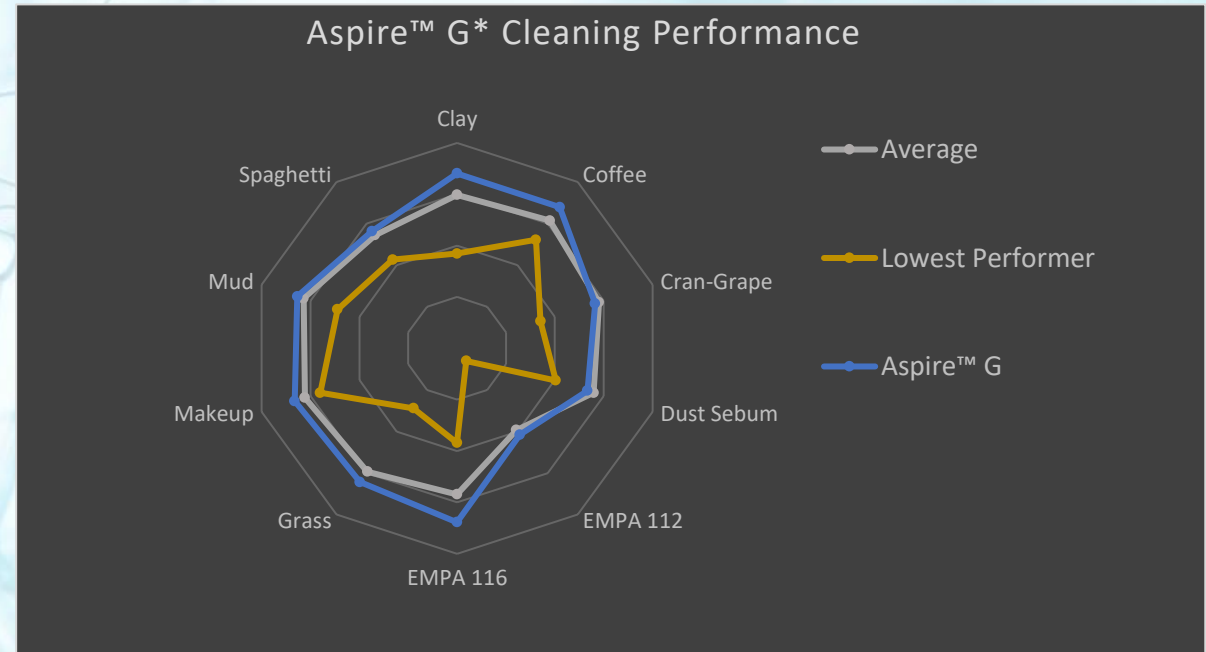
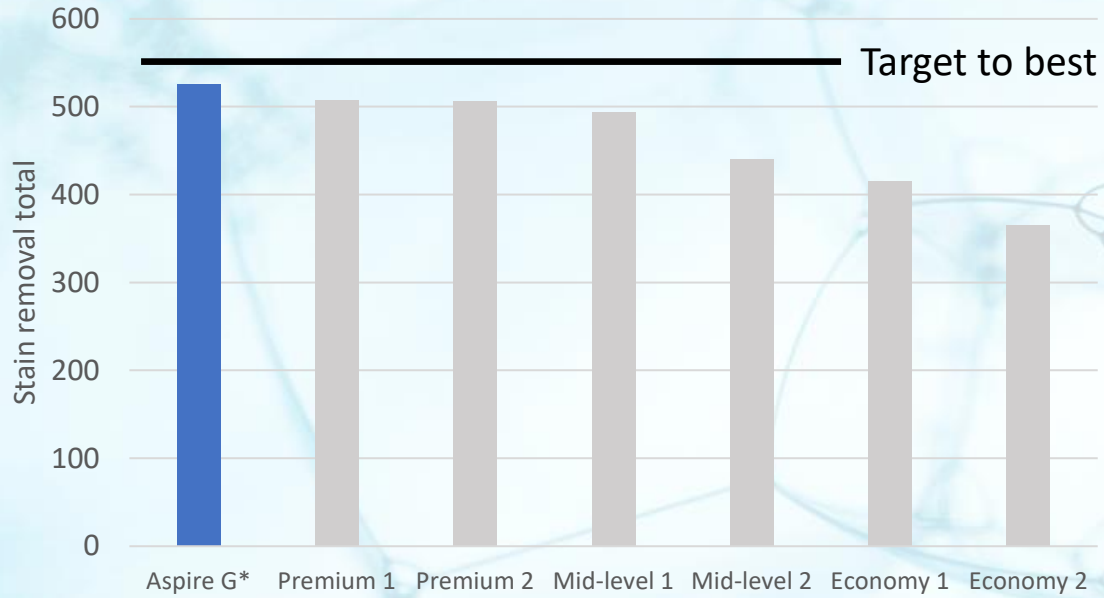


# Liquid laundry detergents

**Aspire™ G Super Concentrate readily formulates into a liquid laundry detergent with excellent stain removal performance when compared to leading household brands.**



Liquid Laundry Stain Removal



Aspire™ G* Laundry Test Formula	Wt%
Aspire™ G Super Concentrate	20.0
Sodium citrate	1.0
Sodium formate	1.0
Novozyme® Medley® Pure (enzyme mix)	3.0
Propylene glycol	3.0

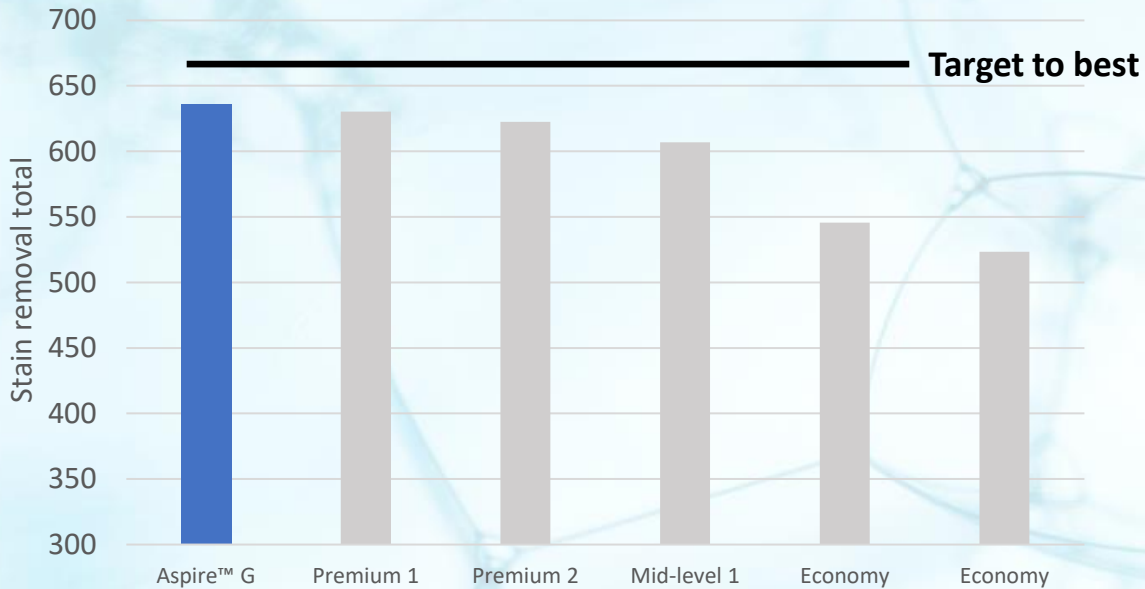
**Aspire™ G\* laundry formula has consistent outstanding stain removal performance**

# Laundry Pods



**Aspire™ G Super Concentrate's compatibility with pod materials and enzymes makes for a high performing laundry product.**

Soil removal for Laundry Pods

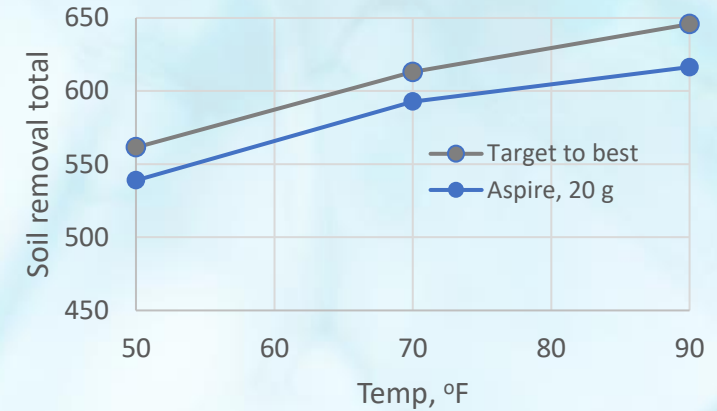


✓ **Aspire™ G Super Concentrate has stain removal performance comparable to the best-selling household brands.**

✓ **It is an excellent performer at water temperatures used in today's washing machines.**

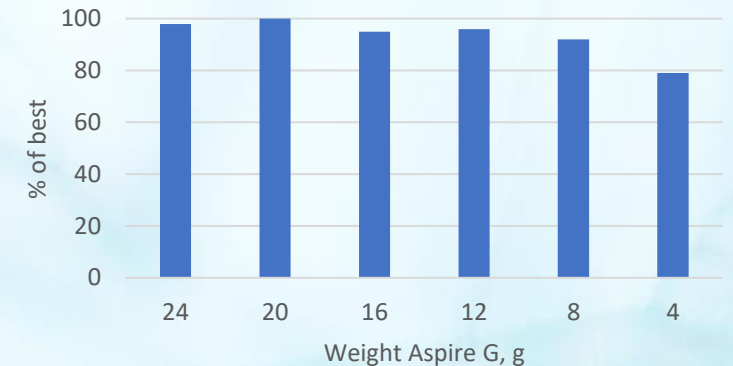
✓ **And it cleans consistently over a range of pod sizes.**

Soil removal vs wash temperature



Note: Best is 25 g pod vs 20 g Aspire™ G Super Concentrate

Strong soil removal performance with dilution





**Multiple grades of liquid laundry detergents are possible with Aspire™ G Super Concentrate**

Suggested formulas for Liquid Detergents			
	Premium	Mid-Tier	Economy
Water	to 100%	to 100%	to 100%
Propylene glycol	5.0		
Aspire™ G Super Concentrate	20.0	15.0	10.0
Sodium citrate	2.0	2.0	2.0
Sodium formate	0.2		
Calcium chloride	0.1		
Aculyn™ 22 (Dow)		2.0	2.0
Sodium hydroxide 10% sol.		1.0	1.0
pH adjustment: Adjust pH to 8-9 using citric acid or sodium hydroxide 10%			
Tinopal® CBS-X	0.05	0.05	0.05
Protease (Progress Uno 100L-Novozymes®)	2.0		
Mannanase (Mannaway 4.0 L-Novozymes®)	1.0		
Amylase (Amplify Prime 100L-Novozymes®)	1.0		
Preservative, perfume, dye	Q.S.	Q.S.	Q.S.



# Carbon footprint reduction

**Aspire™ G Super Concentrate's cleaning efficacy saves trucks on the road lowering its carbon footprint and saving money.**

Ingredient	Aspire™ Mid-Tier	HC-LD-0006
	Wt%	Wt%
Water	to 100%	To 100%
Aspire™ G Super Concentrate	<b>15</b>	
Calsoft® LAS-99		<b>16</b>
Calfoam® ES-303		<b>10.1</b>
Caloxamine® LO		<b>5</b>
<b>Total cleaning</b>	<b>15</b>	<b>31.1</b>
Sodium citrate	2	
Aculyn™ 22 (Dow)	2	
Sodium hydroxide 10% sol.	1	
Sodium hydroxide 50%		4.2
pH adjustment:	NaOH or citric acid	NaOH or LAS-99
Tinopal® CBS-X	0.05	0.05
Masurf® D-445N		2
Preservative, perfume, dye	Q.S.	Q.S.

**Goal**

**300,000 lbs product**

**Aspire™ Mid-Tier**

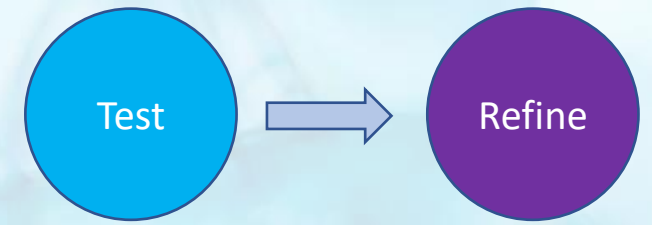
1 x 45,000 lb truck

**HC-LD-0006**

48,000 lb Calsoft® LAS-99  
 30,300 lb Calfoam® ES-303  
 15,000 lb Caloxamine® LO

**Total**

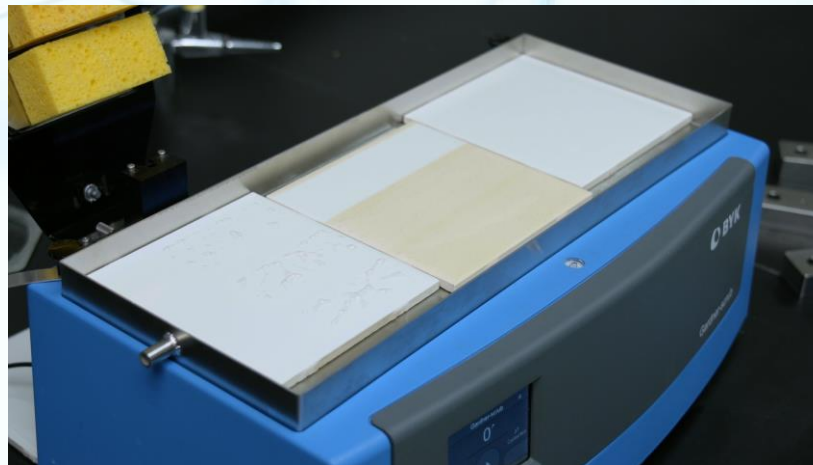
**93,300 lb**



## Greasy Hard Surface

### HCPA DCC-17 – Tough Greasy Kitchen Soil Test Method

- Soil - Lard, Olive Oil, Carbon Black, Clay, Flour, Milk, and Water
- Porcelain coated tiles heated for 30 minutes at 188°C after soil application
- Soiled tiles cleaned 8 cycles using sponges in a straight-line washability apparatus
- 500 g weight per sponge
- Cleaning performance analyzed digitally using Image J processing program



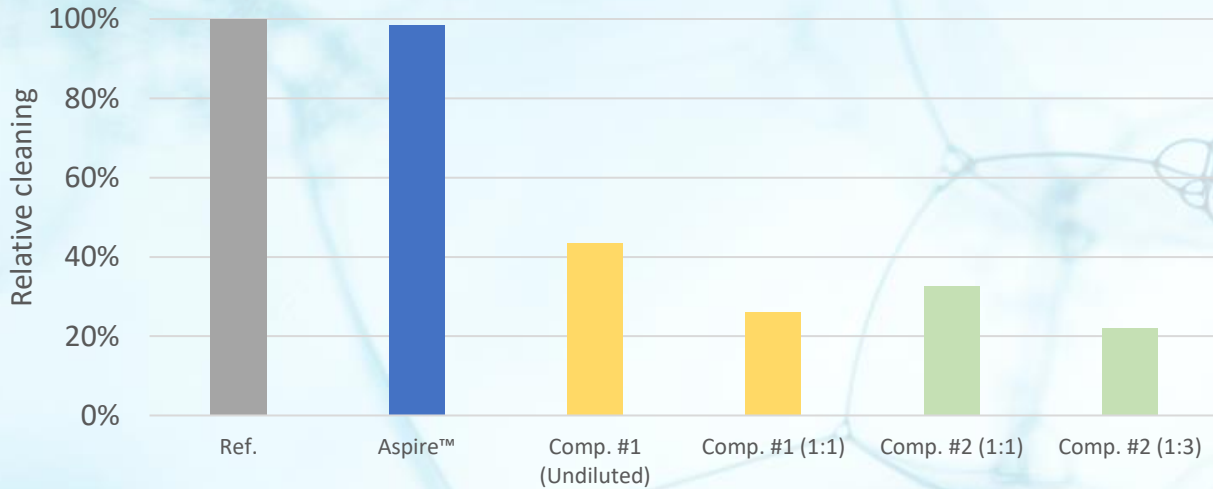


# Hard surface cleaner

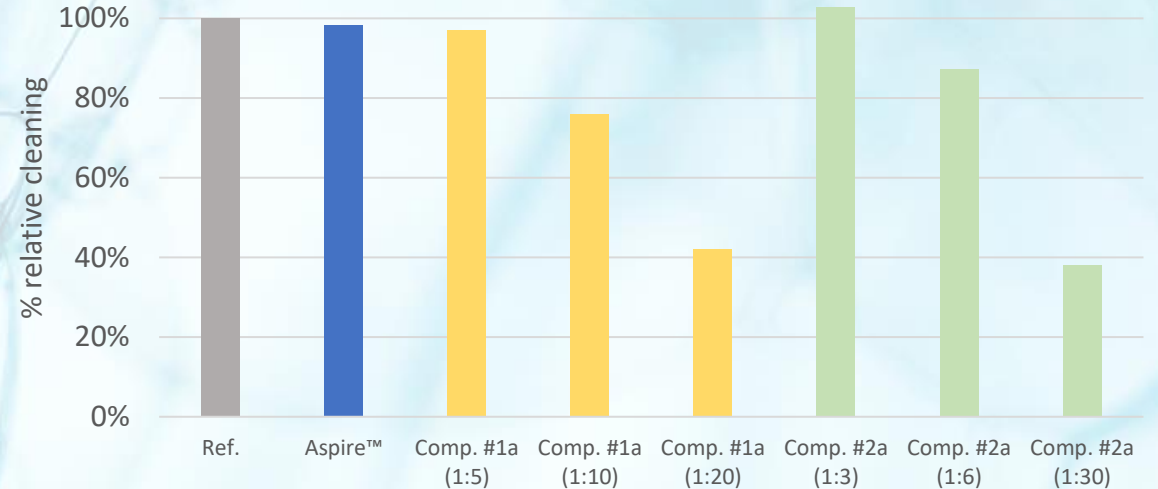


**Low concentrations of Aspire™ G Super Concentrate and solvent produce an outstanding hard surface cleaner/degreaser.**

Standard Performance Dilutable Products



High Performance Dilutable Cleaner/Degreasers



## Model Formula

**0.5% Aspire™ G Super Concentrate**

**0.5% solvent**

**Model formula cost – \$0.02/lb**



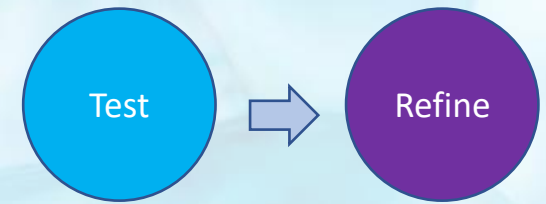
Aspire  
(98%)

Comp. #1a (1:10)  
(79%)

Ref.  
(100%)

**Aspire™ G Super Concentrate formulated with only 1/10<sup>th</sup> solvent\* and 1/2 surfactant\* cleans as well as high performance products.**

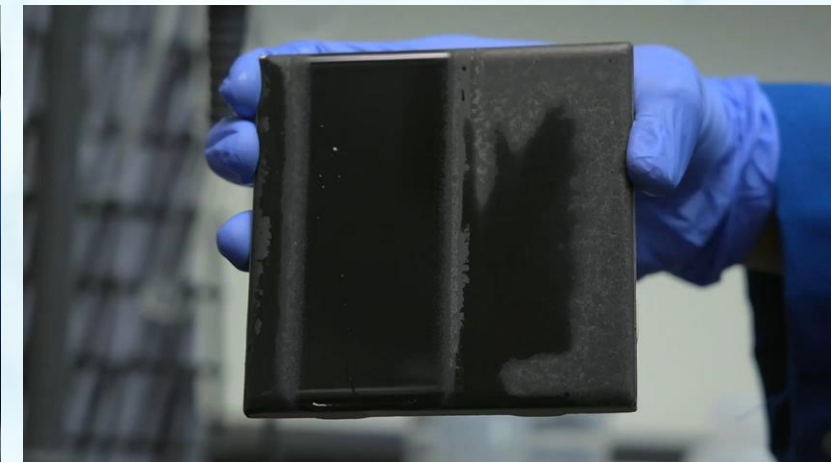
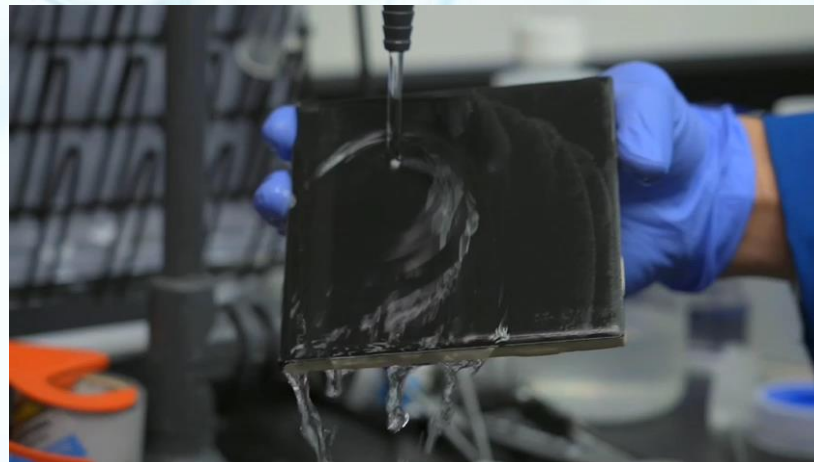
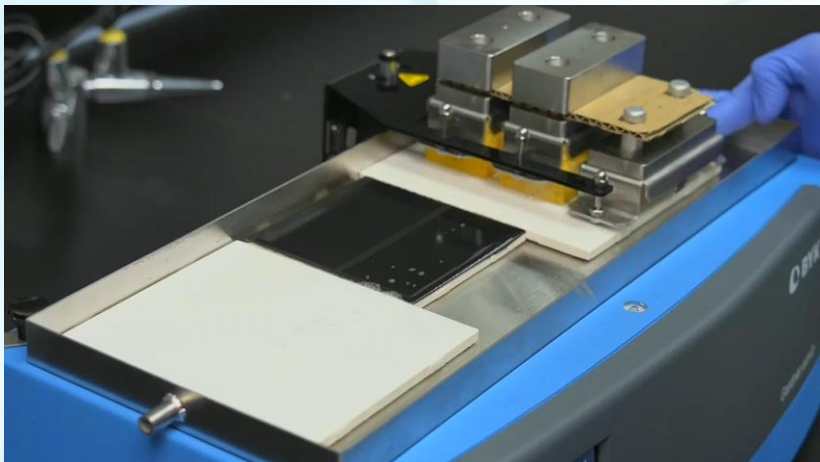
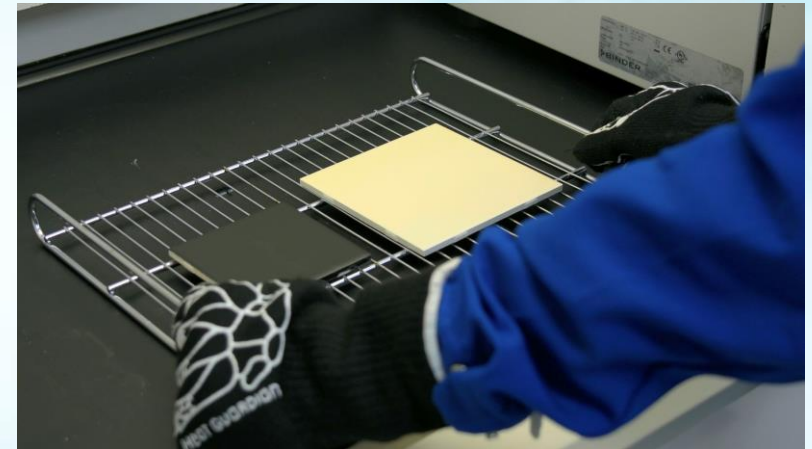
\*mid-point values on manufacturer SDS information



## Bathroom Soap Scum

### HCPA DCC-16

- Soap scum on 4" or 6" ceramic tile
- Soap scum – Ivory Soap, J&J Baby Shampoo, synthetic sebum, clay, hard water
- Soiled tiles heated at 200°C for 20 min
- Soiled tile scrubbed on washability apparatus
- 15 g solution per sponge with 500 g weight per sponge
- Cleaning performance measured with Ho IG-Horiba20 Gloss Checker
- **No soak time**

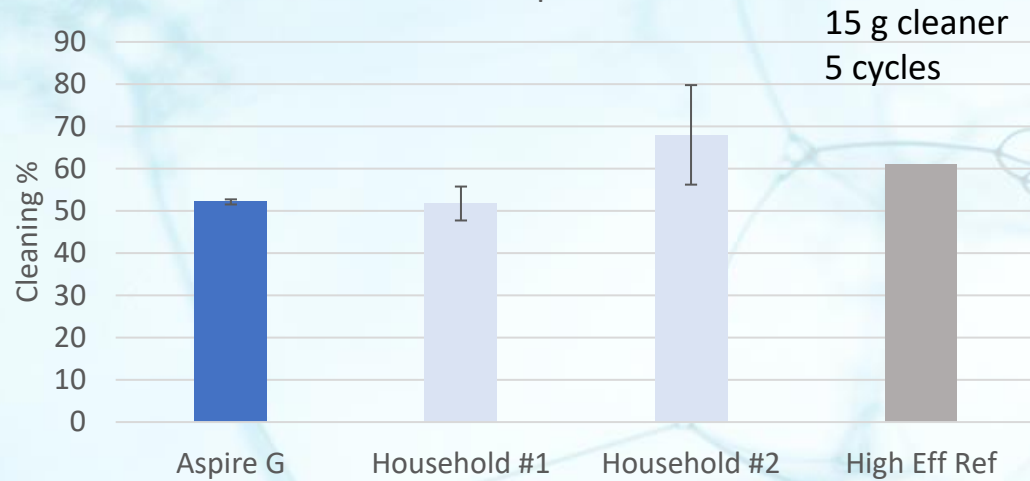


# Bathroom cleaner

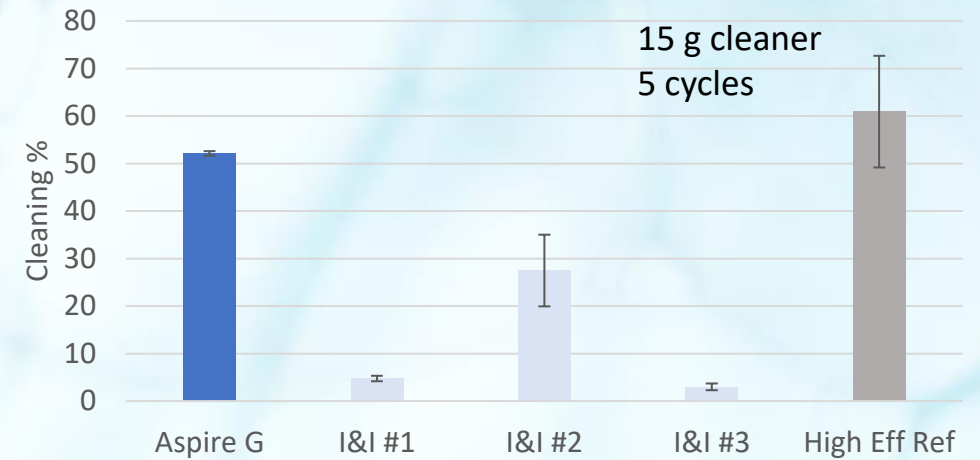
**Aspire™ G Super Concentrate readily formulates into a bathroom cleaner comparable to the best leading household brands and better than I&I brands.**



Aspire™ G Super Concentrate performs like the best household products



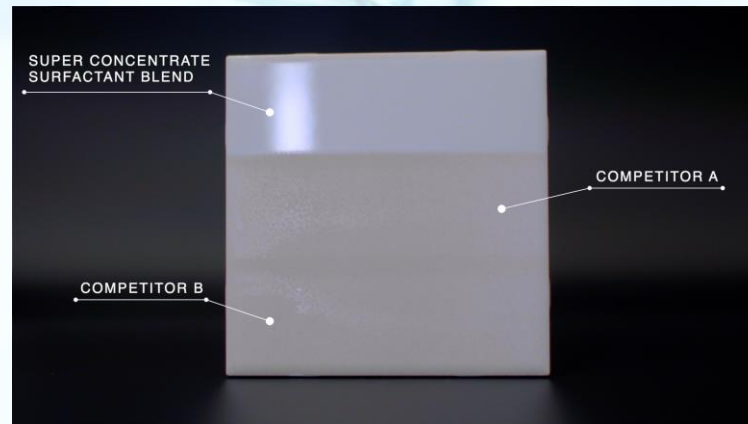
Aspire™ G Super Concentrate performance outshines I&I products



## Model Formula

- 3% Aspire™ G Super Concentrate
- 3% citric acid
- 3% DPnP

**Model Formula cost - \$0.16/lb**



I&I products evaluated at 1:10 dilution which is generally more concentrated than supplier directions.



# Aspire™ G Super Concentrate Delivers

Deliver

**Aspire™ G Super Concentrate is a high-performance blend that formulates into superior and differentiable products.**

## **Multiple grades of liquid laundry detergents**

- ✓ Comparable stain removal performance to top-selling household laundry products
- ✓ Compatible with builders, enzymes, and other laundry detergent components

## **Laundry pods**

- ✓ Compatible with PVOH films
- ✓ Stable performance upon dilution and cold wash temperatures
- ✓ Comparable stain removal performance to leading household laundry pods

## **Hard surface cleaner/degreaser**

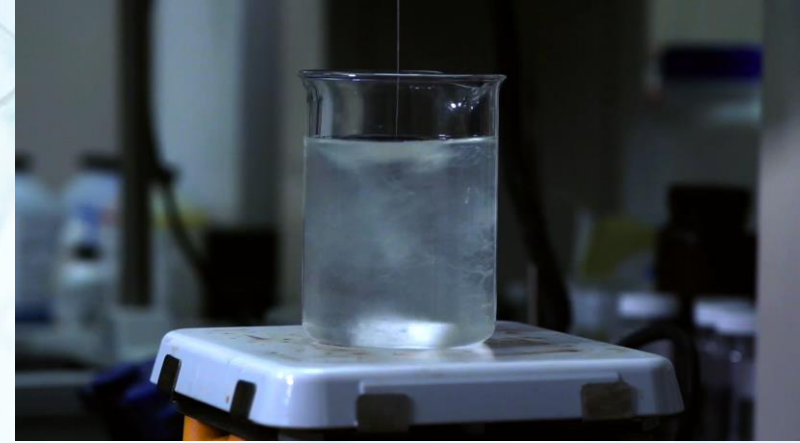
- ✓ Fewer and less chemicals in the formula
- ✓ Performance that matches or exceeds commercially available products

## **Bathroom Cleaner**

- ✓ Facilitates use of organic acids
- ✓ Eliminates need for chelants

# Versatility

**Aspire™ G Super Concentrate's pourability, compatibility, and light color makes it ideal for customization.**



Additive	Quantity of additive	Final pH
Sodium Hydroxide 50%	3.9 g	13.5
Monoisopropanolamine 99%	100 g (Clear mixture)	11.9
Sodium carbonate 25%	18.5 g	10.3
TKPP 50%	6.5 g	9.0
Tetrasodium EDTA 33.3%	23.7 g	9.8
Sodium Metasilicate 20%	20.9 g	13.1
Hydrochloric Acid 37%	1.9g	0.8
Phosphoric Acid 85%	18.0g	0.6
Citric Acid 25%	100g (Clear mixture)	1.5

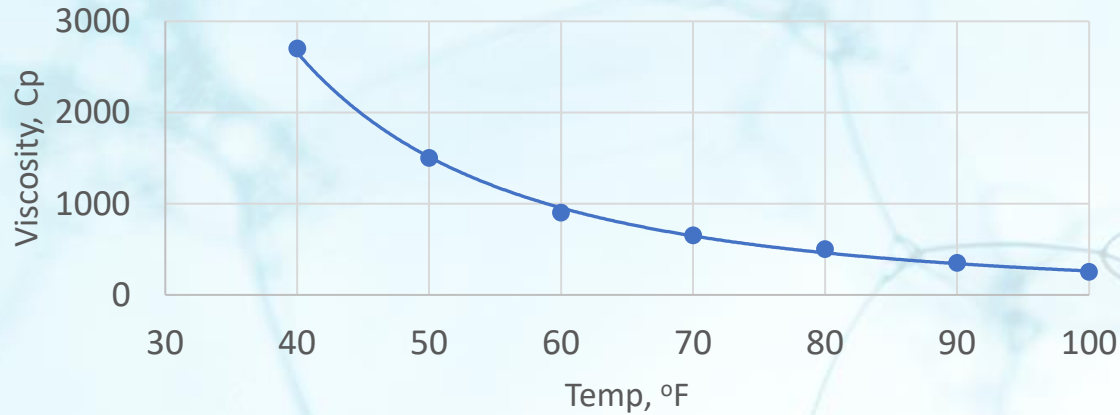


100g of 5% solution of Aspire™ G Super Concentrate was titrated to cloudy/hazy

# Physical properties

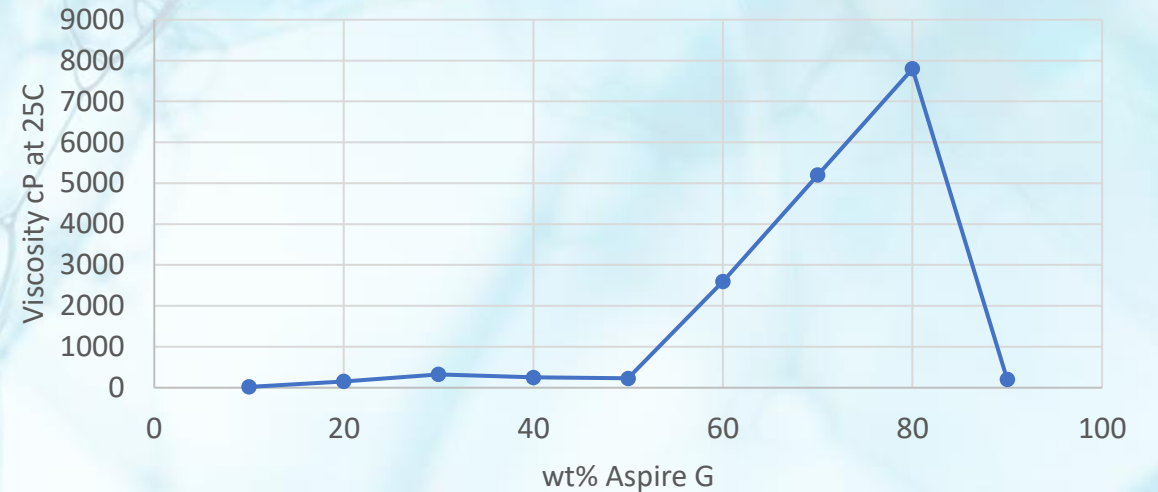
**Aspire™ G Super Concentrate's physical properties make it easy to handle in the plant**

Temperature viscosity curve for Aspire™ G Super Concentrate



**Aspire™ G Super Concentrate has moderate viscosity and is readily pourable and pumpable at temperatures above 50°F.**

Dilution viscosity curve for Aspire™ G Super Concentrate



**When diluted in water, the viscosity profile of Aspire™ G Super Concentrate enables the development of both gel and water-thin products.**

Color (Gardner 10 mm as-is)	0.5
Drave's wetting time:	instantaneous
Freeze Point:	-5° C
Density (lb./gal)	8.7
Ross Miles Foam (mm) 1% solution	149 (initial) - 138 (5 min)
Stability (25° C)	1 year
Stability freeze/thaw - 3 cycles	Stable

# Aspire™ BRC Surfactant Blend

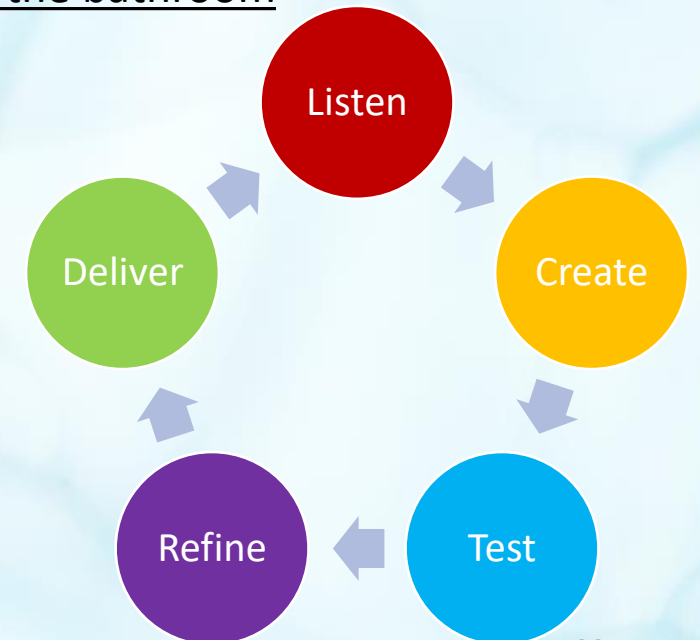
# ASPIRE™ BRC Surfactant Blend

## Bathroom cleaners

- ✓ Soap scum is difficult to clean and is labor intensive
- ✓ Effective cleaners that do not use solvents are hard to formulate
- ✓ Cleaners with mild acids are preferred for consumer and worker safety

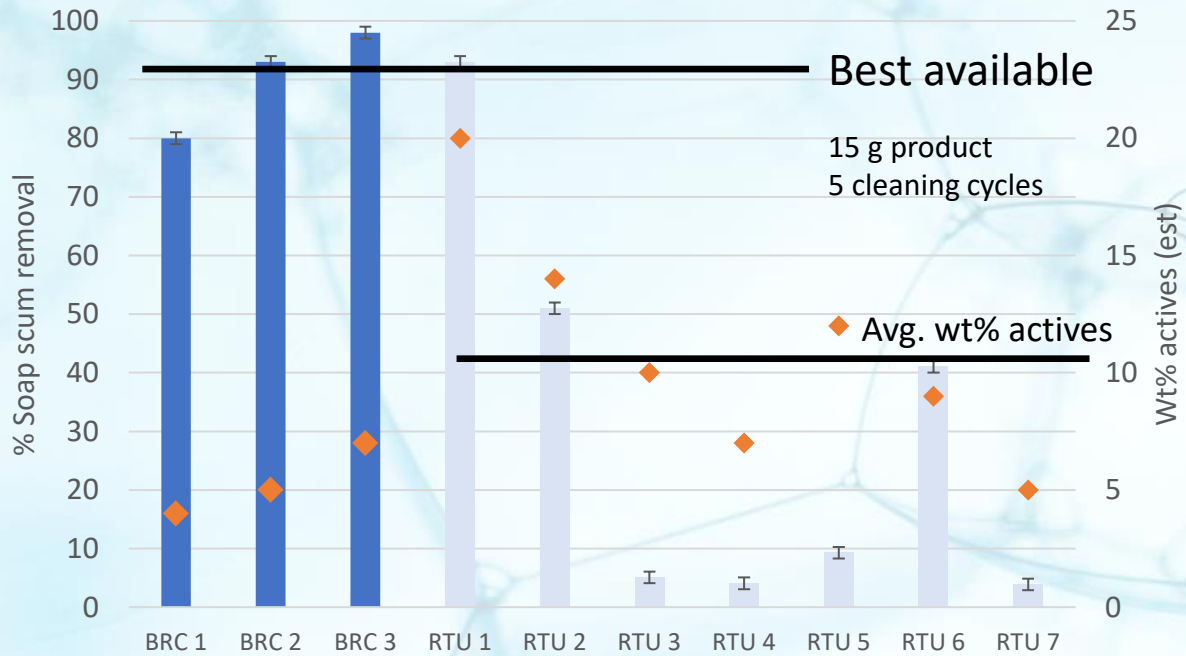
Aspire™ BRC Surfactant Blend is a simple, innovative approach to cleaning the bathroom

- ✓ **Exceptional performance *versus* most home care and I&I products**
  - ✓ Fast acting to significantly reduce time between spraying and wiping
  - ✓ Decreases cleaning effort with fewer wiping cycles
- ✓ High Active Surfactant Blend
- ✓ **Works with a variety of organic acids**
- ✓ **No solvents or chelants needed**
- ✓ **Suitable for RTU and dilutable products**
- ✓ Readily distinguishable by fragrance and color addition
- ✓ Easily handled in the plant
- ✓ Tested by industry standard methods

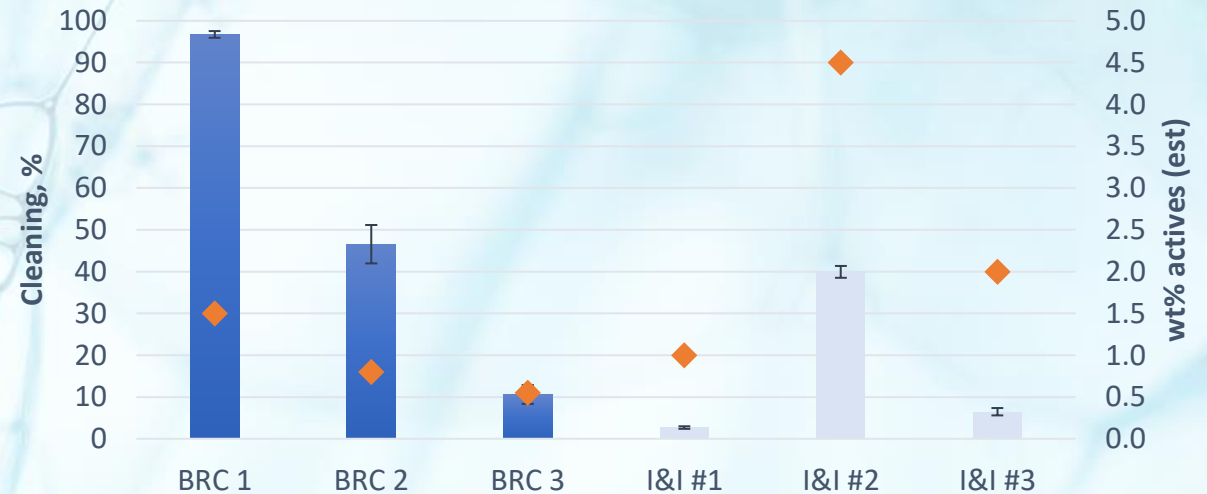


**Aspire™ BRC Surfactant Blend with citric acid is an excellent RTU and dilutable cleaner.**

Aspire™ BRC Surfactant Blend Makes an Excellent RTU Product



Aspire™ BRC Surfactant Blend Performs Well as a Dilutable Cleaner



	Citric acid, wt%	Aspire™ BRC Surfactant Blend, wt%
BRC 1	2	2
BRC 2	2	3
BRC 3	2	5

- ✓ Wt% actives for RTU products estimated from mid-point values in SDS
- ✓ Wt% actives includes surfactants, solvents, and acids
- ✓ Includes household and I&I products

**Base Aspire™ formula**  
10% citric acid + 20% Aspire™ BRC Surfactant Blend

BRC 1 – 1:10 dil  
BRC 2 – 1:20 dil  
BRC 3 – 1:30 dil

**All I&I products diluted 1:10 for testing**

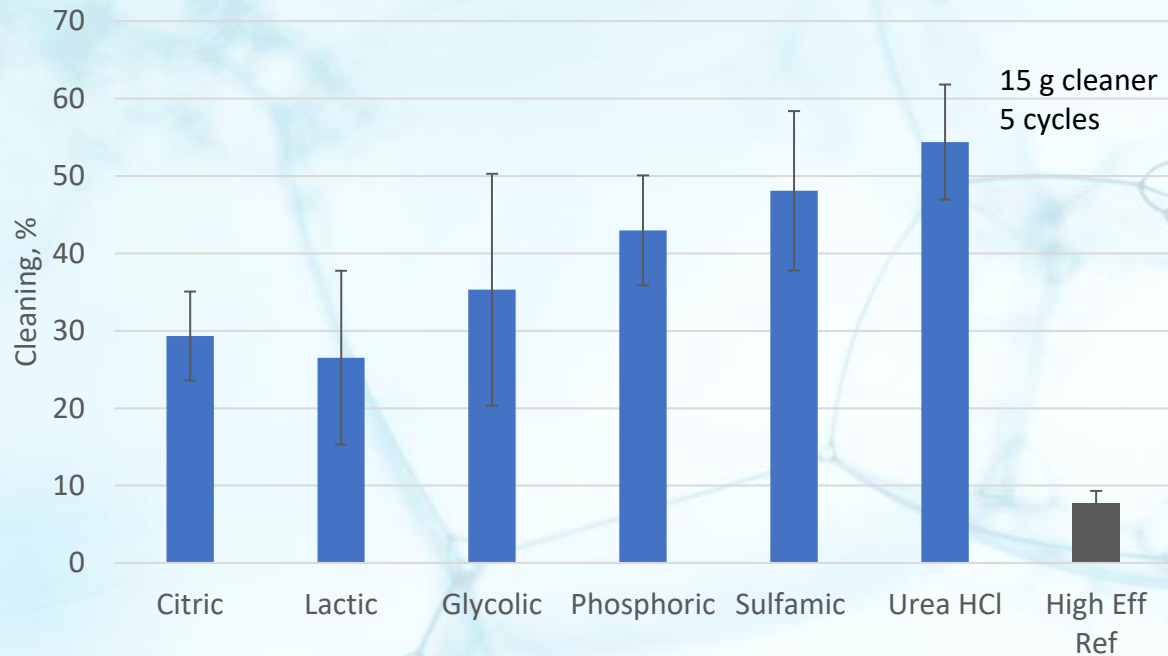
Manufacturer recommended dilutions:  
I&I #1 – 1:20  
I&I #2 – 1:10  
I&I #3 – 1:32

*HCPA DCC-16 test method*

# Flexibility

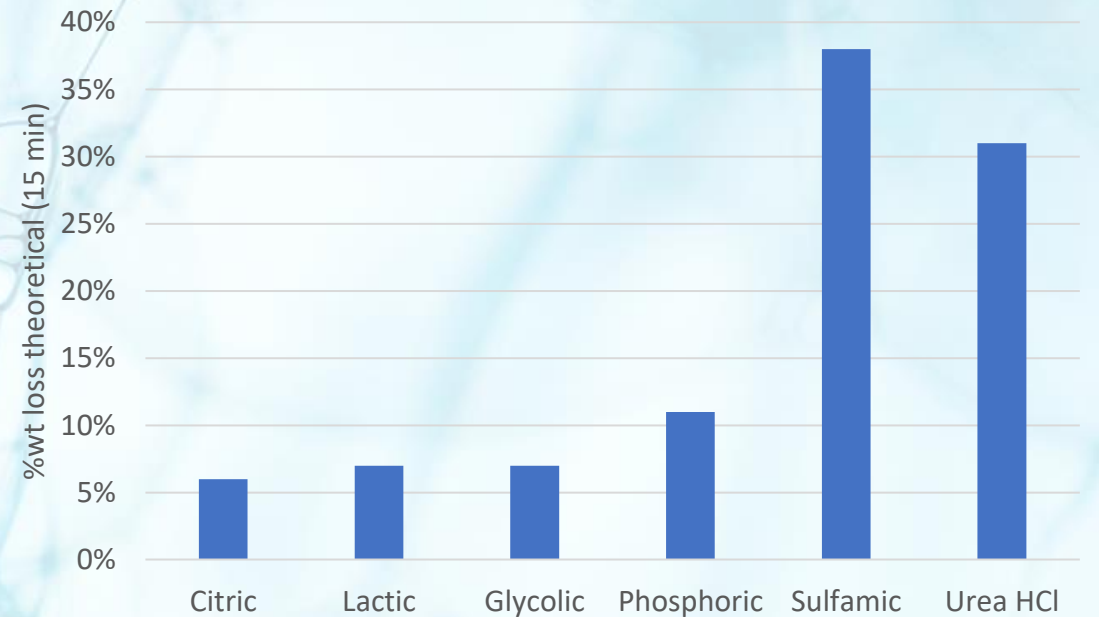
**Aspire™ BRC Surfactant Blend's performance is tunable for the outcome that the formulator wants.**

Aspire™ BRC Surfactant Blend cleans well with common acids



**2% Acid + 2% Aspire™ BRC Surfactant Blend shows modest dependence on the acid type with stronger acids resulting in greater soap scum removal.**

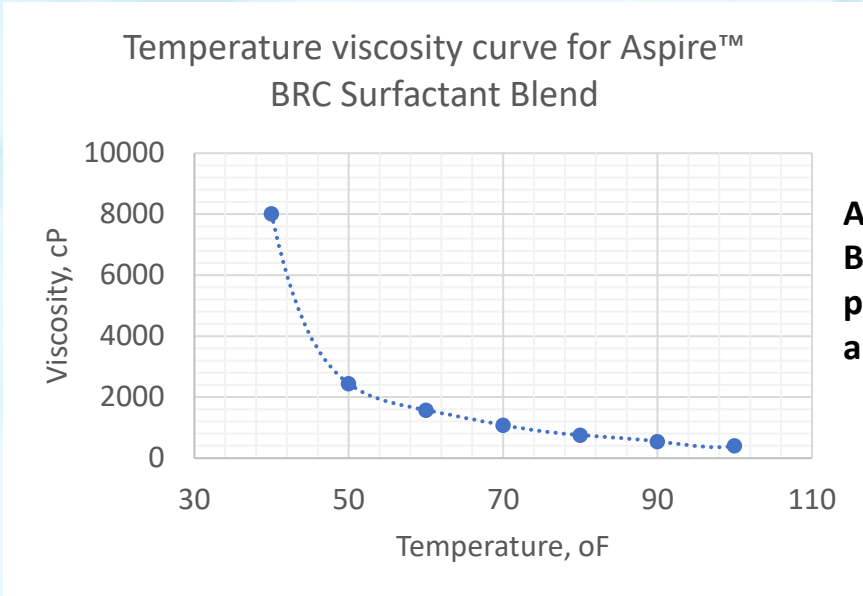
Marble Dissolution (Limescale Removal)



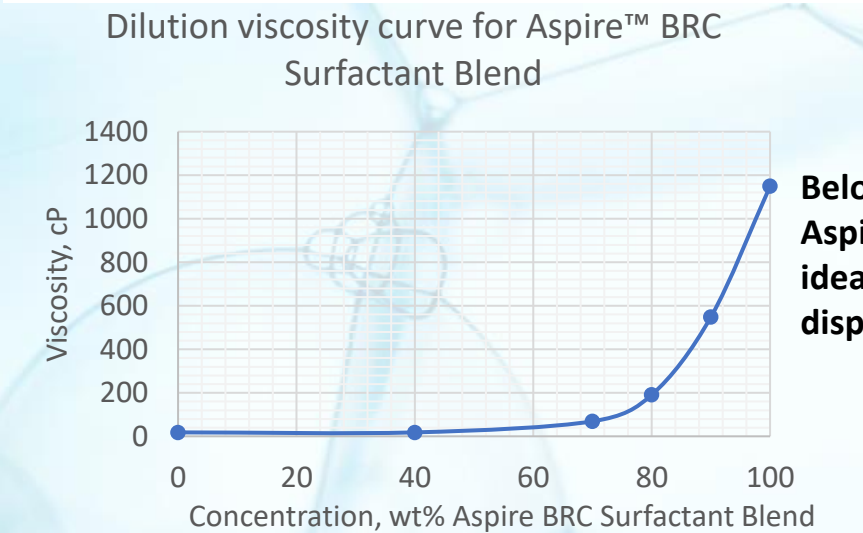
**2% Acid + 2% Aspire™ BRC Surfactant Blend is an effective limescale remover with a strong dependence on acid type.**

# Versatility

**Aspire™ BRC Surfactant Blend retains the pourability, compatibility, and light color of Aspire™ G Super Concentrate**



**Aspire™ BRC Surfactant Blend is readily pourable and pumpable above 50°F.**



**Below 50% concentration Aspire™ BRC Surfactant Blend is ideal for concentrate product dispensers.**

Ross Miles Foam Height (mm) 1% soln.	145 (initial) - 130 (5 min)
Color (Gardner 10 mm as-is)	0.7
Stability (25° C)	1 year
Stability freeze/thaw - 3 cycles	Stable
Freeze Point:	-10° C
Density (lb./gal)	9.2
pH	8 - 10





# Aspire™ HS Super Concentrate

# ASPIRE™ HS Super Concentrate

## Greasy surfaces

- ✓ Greasy surfaces are difficult to clean and labor intensive.
- ✓ Complex formulas in many products.
- ✓ High levels of solvents make these products smell bad.

## Aspire™ HS Super Concentrate is a simple and effective approach to hard surface cleaning

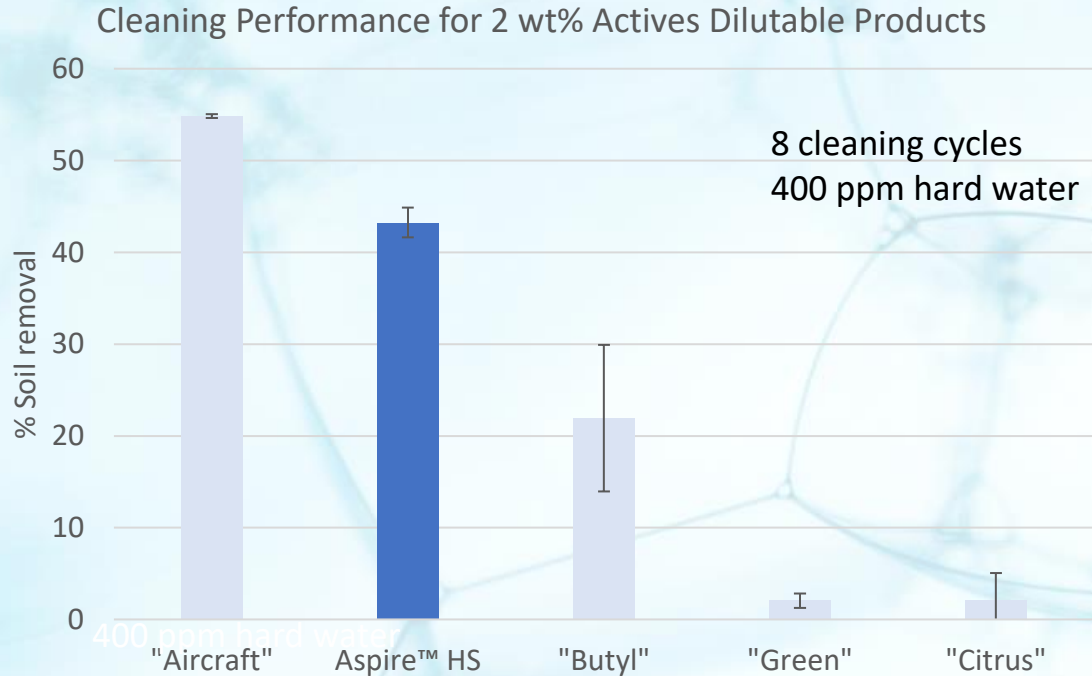
- ✓ **Quick to market cleaner requiring minimal additional formulation**
  - ✓ Super concentrate that is ready for dilution and use
  - ✓ pH adjusted
- ✓ Cleans like commercial dilutable products against greasy soil
- ✓ Uses no harsh solvents
- ✓ Low/no odor
- ✓ Works without the need for chelants
- ✓ Tested using industry standard methods



# High Performance Cleaning

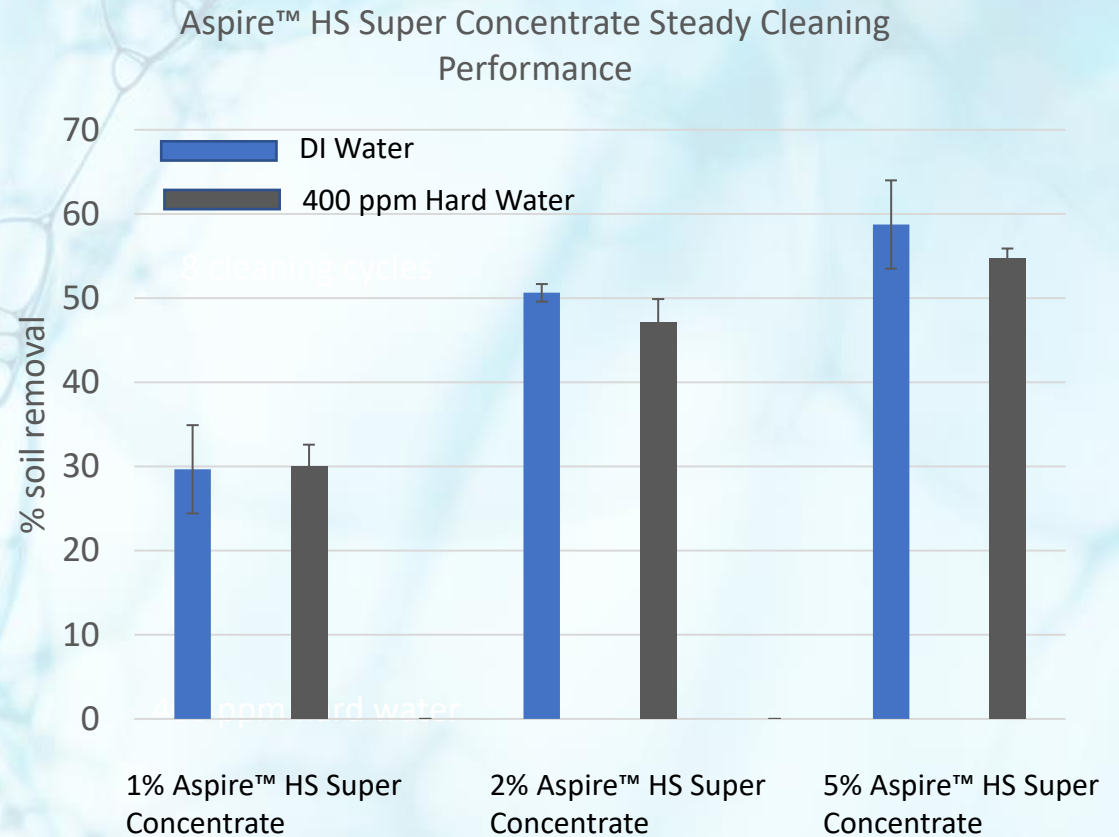


**Aspire™ HS Super Concentrate makes high-performing cleaner/degreaser simply by adding water.**



HCPA DCC-17 – Tough Greasy Kitchen Soil Test Method

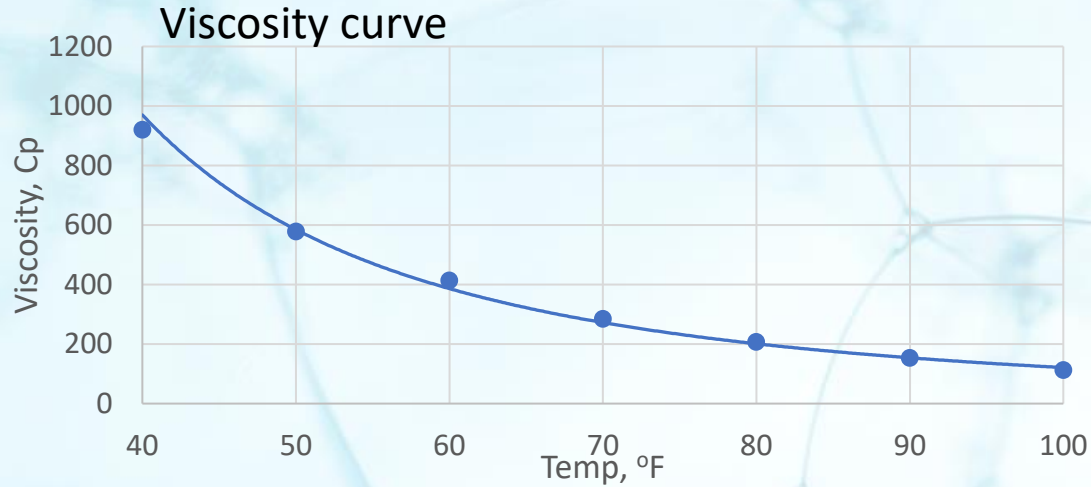
**Aspire™ HS Super Concentrate with no added chelants, solvent, or pH adjustment excels in the industry standard HCPA greasy soil removal tests compared to dilutable products in hard water.**



- ✓ Requires only dilution to produce a superior product
- ✓ Fewer and less chemicals in the formula
- ✓ Performance that matches or exceeds commercially available products

# Versatility

**Aspire™ HS Super Concentrate is “dilution ready” but can be customized to differentiate products.**



Ross Miles Foam Height mm 1% soln	128 (initial) - 117 (5 min)
Color (Gardner 10 mm as-is)	0.4
Drave's wetting time 1.0 wt% (as-is)	Instantaneous
Freeze Point:	-1.0°C
Density (lb./gal)	8.53
pH (10% by wt. solution)	10 - 11
Stability (25° C)	1 year
Stability (freeze/thaw – 3 cycles)	Stable

Additive	Quantity of additive	Final pH
Monoisopropanolamine 99%	100 g (Mixture still clear)	12.4
Sodium carbonate 25%	12.6 g	10.9
Tetrasodium Glutamate Diacetate 47%	9.5 g	10.7

100g of 5% solution of Aspire™ HS Super Concentrate was titrated to cloudy/hazy

# Summary

- ✓ The unique blend of cationic, anionic, and non-ionic surfactants in Aspire™ G Super Concentrate makes it ideal for formulators looking for maximum versatility in a single blend.
- ✓ Aspire™ G Super Concentrate streamlines product development by providing an effective surfactant base upon which to build unique products.
- ✓ Aspire™ HS Super Concentrate and Aspire™ BRC Surfactant Blend are “ready-to-go” and just await personalization or they are amenable to further formulation.
- ✓ No special handling is needed for Aspire™ products, a feature that will be appreciated by plant personnel.



# Questions?

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**Please contact us!**