

**ADVANCED
CLEANING
PRODUCT
FORMULATIONS**

Volume 5

Ernest W. Flick



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To
the late Ernie and Jeanne
and
Allyn and Barbara
and
Chris and Rachel

Preface

This book (Volume 5) presents more than 423 up-to-date advanced cleaning product formulations for household, industrial and automotive applications. It is the result of information received from numerous industrial companies and other organizations. The data represent selections made at no cost to, nor influence from, the makers or distributors of these materials. Only the most recent formulas have been included. All formulations are completely different than those contained in Volumes 1, 2, 3 and 4 published earlier.

Formulation in the cleaning product industry has gradually been undergoing significant change during the past years. Raw materials costs have risen and manufacturers have been reluctant to pass along these increases. Environmental considerations have also played a part. By changing formulations to improve cost/performance characteristics, manufacturers have been able to control costs but still enhance performance. This book presents manufacturers' suggested formulations which might meet new performance criteria.

The formulations in this book are divided into the following sections and chapters, with the number of formulations indicated in ():

- I. Household and Industrial Cleaners and Polishes
 1. Bathroom Cleaners (9)
 2. Dairy, Food and General Industrial Cleaners (27)
 3. Degreasers (9)
 4. Dishwashing Detergents (34)
 5. General Purpose Cleaners (31)
 6. Glass Cleaners/Polishes (12)
 7. Hard Surface Cleaners (21)
 8. Laundry Products (55)
 9. Metal Cleaners and Polishes (72)
 10. Oven, Grill and Hot Plate Cleaners (9)
 11. Polishes, Coatings and Finishes (6)
 12. Rinse Aids (2)
 13. Rug, Floor, Carpet, Upholstery Shampoos and Cleaners (33)
 14. Miscellaneous (33)

- II. Transportation Cleaners and Polishes
 - 15. Auto Cleaners and Polishes (6)
 - 16. Car and Truck Wash Compounds (49)
 - 17. Whitewall Tire Cleaners (3)
 - 18. Miscellaneous (12)

Each formula is located in the chapter which is most applicable. The reader, seeking a formula for a specific end use, should check each chapter which could possibly apply. In addition to the above, there are two other sections which will be helpful to the reader.

- III. A chemical trademark section where each tradenamed raw material included in the book is listed with a chemical description and the supplier's name. The specifications which each raw material meets are included, if applicable.
- IV. Main office addresses of the suppliers of trademarked raw materials.

Each formulation in the book lists the following information, as available, in the manufacturer's own words:

- Description of end use and most outstanding properties.
- The percent by weight or volume of each raw material included in the formula, rounded to a decimal figure.
- Key properties of the formula, which are the features that the source considers to be more outstanding than other formulations of the same type.
- The formula source, which is the company or organization that supplied the formula. The secondary source may be the originating company and/or the primary source's publication title, or both. A formula number is included, if applicable.

The table of contents is organized in such a way as to serve as a subject index.

My fullest appreciation is expressed to the companies and organizations who supplied the original starting formulations included in this book. I also thank the suppliers of the raw materials included in these formulations, who furnished information describing their trademarked raw materials.

NOTICE

To the best of our knowledge the information in this publication is accurate; however, the Publisher does not assume any responsibility or liability for the accuracy or completeness of, or consequences arising from, such information. This book is intended for informational purposes only. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the Publisher. Final determination of the suitability of any information or product for use contemplated by any user. We recommend that anyone intending to rely on any recommendation of materials or procedures mentioned in this publication should satisfy himself as to such suitability, and that he can meet all applicable safety and health standards.

1. Bathroom Cleaners

Acidic Toilet Bowl Cleaner

Carbopol resins are used to thicken this acidic toilet bowl cleaner formulation. In addition, the use of the resin provides vertical cling to increase the contact time of the detergent on the soiled surface and enhance consumer convenience.

<u>Ingredient:</u>	<u>Wt%</u>
DI Water	43.00
Carbopol 674 (1)	2.00
Citric Acid (50%)	50.00
Alkyl benzene sulfonic acid (97%) (2)	2.00
Sodium dodecyl diphenyloxide disulfonate (45%) (3)	3.00

Brookfield viscosity (RVT-20 rpm): 4,000 cps
 Product pH: 1.0-2.0
 Product Clarity: Clear

- (1) BFGoodrich
 (2) Stepan Co.: Biosoft S-100
 (3) Dow Chemical Co.: Dowfax 2A1

Procedure:

- Mix the DI water and citric acid solution together.
- Using moderate agitation (800 rpm) provided by a Lightnin' Mixer or similar variable speed unit and an impeller suitable for general mixing and blending operations, disperse or screen the Carbopol resin into the water/citric acid solution. Mix the slurry for approximately 30 minutes. The product will become increasingly thicker with time - heating to 40-50C will hasten the process.
- Add the sulfonic acid and the diphenyloxide disulfonate surfactant.
- Add color and fragrance, as desired. Cool the product to room temperature.

Total Actives:

Citric acid: 25.00
 Alkyl benzene sulfonic acid: 1.94
 Dodecyl diphenyloxide disulfonate: 1.35

SOURCE: BFGoodrich Specialty Chemicals: DET-351

Bathroom Cleaner with Disinfectant

<u>Ingredients:</u>	<u>Wt.%*</u>
A: Veegum T, Magnesium Aluminum Silicate	1.00
Rhodopol 23, Xanthan Gum	0.35
Deionized Water	86.65
B: Diatomaceous Earth (Super Floss)	5.00
Tetrasodium EDTA (Hampene 100)	2.75
Sodium o-Phenylphenate (Dowicide A)	0.25
Sodium Alkylbenzene Sulfonate (Calsoft L-40)	3.00
Butyl Cellosolve	1.00

Procedure:

1. Dry blend the Veegum T and Rhodopol 23 and add them to the water while stirring with an homogenizer at 5000 rpm. Continue mixing for 30 minutes.
 2. Slowly add the Part B ingredients in the order shown, mixing each for 5 minutes.
- * As received basis

SOURCE: R.T. Vanderbilt Co., Inc.: Formulation No. 363

Heavy Duty Acid Bathroom Cleaner

<u>Ingredients:</u>	<u>Wt%</u>
Hydroxyacetic acid	5.0
Sulfamic acid	5.0
Ammonyx LO	10.0
Water, D.I.	80.0

Mixing Procedure:

Add ingredients to water in the order given and mix until homogeneous.

Properties:

Appearance: Clear liquid
pH, as is: 1.0
Solids, %: 14.0
Density, lbs/gal: 8.7

Use Instructions:

Use as is or dilute as needed. Do not use on natural marble or polished aluminum. Use gloves. Do not mix with bleach.

Storage Stability:

Formulation is freeze/thaw stable through 3 cycles.
Formulation is stable for 3 weeks @ 50C.

SOURCE: Stepan Co.: Formulation No. 200

Mildew Remover

<u>Ingredients:</u>	<u>Wt%*</u>
Van Gel 0	3.00
Deionized Water	85.55
Sodium Hydroxide, 50% Solution	0.45
Sodium Hypochlorite, 10% Solution (Hypure N)	10.00
Vanseal NALS-30	1.00

Procedure:

1. Slowly sprinkle the Van Gel 0 into water at room temperature while mixing with a homogenizer or dispenser operating at 5000 rpm. Continue mixing for 40 minutes.
2. Add sodium hydroxide and mix until uniformly dissolved. Slow the mixer to 1000 rpm or less.
3. Add the Vanseal NALS-30. Avoid air entrapment. Mix until uniform.

Formulation No. 458

Bowl/Mildew Cleaner

<u>Ingredients:</u>	<u>Wt%*</u>
A: Veegum T, Magnesium Aluminum Silicate	5.00
Tetrasodium Pyrophosphate (TSPP)	0.25
Water	50.75
B: Sodium Hypochlorite, 5.25%	34.00
Sodium Metasilicate, Anhydrous	10.00

Procedure:

1. Dry blend the Veegum T and TSPP. Slowly add the water while agitating at maximum available shear. Continue until smooth.
2. Add Part B ingredients slowly in the order shown, mixing after each addition until smooth and uniform.

Formulation No. 424

*As received basis

SOURCE: R.T. Vanderbilt Co., Inc.: Suggested Formulations

Tile, Porcelain and Bathroom Cleaner, Acid

<u>Ingredients:</u>	<u>Wt%</u>
Water, D.I.	75.5
Xanthan Gum	0.5
Petro BAF Powder	2.0
Phosphoric Acid, 75%	12.0
Hydroxyacetic Acid, 70%	10.0
Perfume, Dye	q.s.

Blending Procedure:

Add Xanthan Gum slowly to water with high speed mixing. Allow to mix until material thickens. Add remaining ingredients in order listed. If problems develop adding Xanthan Gum to water, premix the Xanthan Gum in some isopropanol before adding to water.

Formula 529

Tub and Tile Cleaner

<u>Ingredient:</u>	<u>Wt%</u>
Water, D.I.	67.4
Phosphoric Acid, 86%	17.6
Hydrochloric Acid, 37%	13.5
Rewoteric AM TEG	0.5
Varonic T202 SR	1.0

Blending Procedure:

Add ingredients in order shown and dissolve completely between each addition.

Typical Properties:

Viscosity, cps: 293

Solids: 16.3%

pH: 1.7

Formula 530

Hypochlorite Tub and Tile Cleaner and Mildew Stain Remover

<u>Ingredients:</u>	<u>Wt%</u>
Water, D.I.	44.9
Sodium Hydroxide (30%)	1.0
Varox 365	1.5
Sodium Hypochlorite (5.7%)	52.6

Blending Procedure:

Add ingredients in order shown and dissolve completely between each addition.

Typical Properties:

Viscosity, cps: 4

Solids: 3.8%

pH: 13.5

Formula 531

SOURCE: Witco Corp.: Suggested Formulations

Toilet Bowl Cleaner with Bleach

Carbopol resins are used to thicken this toilet bowl with chlorine bleach formulation. In addition, the use of the resin provides vertical cling to increase the contact time of the detergent on the soiled surface and enhance consumer convenience.

<u>Ingredient:</u>	<u>Wt%</u>
DI Water	60.75
Carbopol 676 (1)	1.25
Potassium hydroxide (45%)	5.00
2.1r Potassium silicate (39%) (2)	5.00
Potassium carbonate	5.00
Sodium hypochlorite (12.50%)	8.00
Amine Oxide (30%) (3)	10.00

Brookfield viscosity (RVT-20rpm): 2,500 cps
 Product pH: 12-13
 Product clarity: Opaque

- (1) BFGoodrich
- (2) PQ Corp.
- (3) Lonza, Inc.: Barlox 12

Procedure:

1. Using moderate agitation (800 rpm) provided by a Lightnin' Mixer or similar variable speed unit and an impeller suitable for general mixing and blending operations, disperse or screen the Carbopol resin into the DI water. Mix the slurry for approximately 15 minutes or until the slurry is homogeneous.
2. With constant agitation, add the potassium hydroxide and the potassium silicate. Mix until homogeneous.
3. Continue agitation and add the potassium carbonate followed by the bleach.
4. Add the amine oxide surfactant and mix until homogeneous.
5. Add color and fragrance, as desired.

Total Actives:

Silicate (as SiO₂): 1.32
 Carbonate (as Na₂CO₃): 3.84
 Available Chlorine: 1.00
 Amine Oxide: 3.00

SOURCE: BFGoodrich Specialty Chemicals: DET-350

2. Dairy, Food and General Industrial Cleaners

Acid Industrial and Household Cleaners
Oxalic Acid Gel

<u>Ingredients:</u>	<u>Wt. %*</u>
Water	53.70
Van Gel B	2.50
Rhodopol 23	0.80
Oxalic Acid Dihydrate, 12.5% Aqueous Solution	40.00
Polysorbate 40 (Tween 40)	3.00

Procedure:

1. Dry blend the Van Gel B and Rhodopol 23 and add them to the water while mixing with a propeller stirrer at 1800 rpm. Continue mixing for 60 minutes.
2. Reduce the stirrer speed to produce a slight vortex and slowly add the oxalic acid solution.
3. When all the acid has been added, add the Polysorbate 40 and mix until uniform.

Formulation No. 466

Rust Removal Jelly

<u>Ingredients:</u>	<u>Wt %*</u>
Water	53.20
Van Gel B	3.00
Rhodopol 23	0.80
Phosphoric Acid, 50% Aqueous Solution	40.00
Octoxynol-9	3.00

Procedure:

1. Dry blend the Van Gel B and Rhodopol 23 and add them to the water while mixing with a propeller stirrer at 1800 rpm. Continue mixing for 60 minutes.
2. Reduce the stirrer speed to produce a slight vortex and slowly add the Phosphoric Acid solution.
3. After all the acid has been added, add the Octoxynol-9 and mix until uniform.

Formulation No. 467

*As received basis

SOURCE: R.T. Vanderbilt Co., Inc.: Suggested Formulations

Cleaners for Industrial Application

Desinfecting Cleaner, Acid

<u>Ingredients:</u>	<u>Wt%</u>
Water	48.0
Phosphoric acid (85%)	24.0
Sulphuric acid (98%)	5.0
Propetal 241	3.0
Dodigen 226	20.0
Formula CT 06-06-01	

Dipping Cleaner

<u>Ingredients:</u>	<u>Wt%</u>
Water	75.5
Tetrapotassium pyrophosphate	10.0
Caustic soda	1.5
Dipropylene glycol monomethyl ether	5.0
Sulfetal 4069	5.0
Zusolat 1008/85	3.0
Formula CT 07-03-01	

Spray Cleaner

<u>Ingredients:</u>	<u>Wt%</u>
Water	58.0
Cublen D50	3.0
Triethanolamine	3.0
Sulfetal 4105	4.0
Propetal 241	2.0
Zusolat 1005/85	0.5
Phosfetal 201	2.0
Butyl glycol	5.0
Citrus terpene	0.5
Inhibitor 4000	22.0
Formula CT 07-06-01	

<u>Ingredients</u>	<u>Wt%</u>
Water	86.0
Sulfetal 4105	6.0
Propetal 99	3.0
Zusolat 1005/85	0.5
Butyl glycol	4.0
Orange terpene	0.5
Formula CT 07-06-03	

SOURCE: Zschimmer & Schwarz GmbH & Co.: General Formulations

Destainer
(Phosphate, Powder)

Soil-Organic stains: food, mold and grass
 Surface-Cement, wood, paint, polymeric
 Application Method-Brush
 Manufacture-Dry blend/Agglomeration

<u>Composition:</u>	<u>Wt%</u>
*STPP	25.0
Metso Beads 2048	25.0
Sodium Sulfate	8.0
PQ Epsom Salt	2.0
**Octylphenoxy Polyethoxyethanol, 9-10 Moles EO	2.0
Sodium Perborate, Monohydrate	38.0

Use Dilution: 2.3-4.5% bw (3-6 oz/gallon)

- * FMC
- ** Rhone Poulenc Igepal CA-630

Destainer
(Reduced Phosphate, Powder)

Soil-Organic stains: food, mold and grass
 Surface-Cement, wood, paint, polymeric
 Application Methods-Brush
 Manufacture-Dry blend/Agglomeration

<u>Composition:</u>	<u>Wt%</u>
*STPP	10.0
Metso Beads 2048	25.0
Sodium Sulfate	8.0
PQ Epsom Salt	2.0
**Octylphenoxy Polyethoxyethanol, 9-10 Moles EO	2.0
Valfor 100 Zeolite A	15.0
Sodium Perborate, Monohydrate	38.0

Use Level: 3-6 oz/gallon

- * FMC
- ** Rhone-Poulenc Igepal CA-630

SOURCE: PQ Corp.: Detergent Formulation Guide

Egg Cleaner
(Zero phosphate, powder)

Soil-Protein
Surface-Egg and egg handling equipment
Application Method-High pressure spray (700-1400 psi)
Manufacture-Dry blend

<u>Composition:</u>	<u>Wt%</u>
Sodium Carbonate	30.0
Metso Beads 2048	20.0
Sodium Sulfate	12.0
Valfor 100 Zeolite A	30.0
*Sodium Dichloroisocyanurate 2H2O	3.0
**Sodium Alkylaryl Sulfonate Powder (90%)	5.0

Use Dilution: 0.75-1.5% bw (1-2 oz/gallon)

- * Olin Chemical
- ** Witco

Baking Pan Cleaner
(Phosphate, Powder)

Soil-Animal fat and grease, vegetable oil
Surface-Aluminum and steel
Application Method-Immersion/brush
Manufacture-Dry blend/Agglomeration

<u>Composition:</u>	<u>Wt%</u>
*Sodium Carbonate	35.0
*STPP	12.0
**Nonylphenoxy Polyethoxyethanol, 9-10 Moles EO	3.0
Metso Pentabead 20	50.0

Use Dilution: 1.5% bw (2 oz/gallon)

- * FMC
- ** Rhone-Poulenc Igepal CO-630

SOURCE: PQ Corp.: Detergent Formulation Guide

Heavy Duty Cleaners
All Purpose-Food Process Plant

<u>Ingredients:</u>	<u>Weight%</u>
Water	74.00
EDTA (Ethylenediaminetetracetic Acid)	2.00
TKPP (Tetra Potassium Pyrophosphate)	4.00
Pilot SXS-40	5.00
KOH, 45%	10.00
Calamide C	5.00

Comments about this formula:

1. Add ingredients in order listed.
 2. Water and EDTA give a milky white solution.
 3. Upon adding the other ingredients the solution is clear.
 4. EDTA can be substituted with Na₄EDTA to make a clear final solution.
 5. This is a heavy duty cleaner for food processing plants.
 6. Use level. 2-4 oz per gallon.
- Formulation HDC-004-01

Hard Surface Spray Cleaner

<u>Ingredients:</u>	<u>Weight%</u>
Water	89.00
TKPP (Tetra Potassium Pyrophosphate)	1.00
Ethylene Glycol Monobutyl Ether	3.00
Calsuds 81	4.00
NH ₄ OH, 28%	3.00

Comments about this formula:

1. Ingredient Water and TKPP when mixed are clear.
 2. Hazy solution when Ethylene Glycol Monobutyl Ether is added.
 3. With the addition of Calsuds 81 the solution turns clear and has a pH of 9.
 4. When NH₄OH is added, the pH increases to 12.
- Formulation HDC-002-01

SOURCE: Pilot Chemical Co.: Suggested Formulations

High Foaming Alkaline Cleaner

Monateric EH contributes to detergency and effectively controls both the krafft and cloud point in this high foaming formulation.

<u>Ingredients:</u>	<u>Wt%</u>
Water	76.0
Sodium Hydroxide (50%)	10.0
Sodium Metasilicate (Pentahydrate)	2.0
Dodecylbenzenesulfonic acid	2.0
Monateric EH	8.0
Nonoxynol-10	2.0

Procedure:

Add ingredients in the order listed with agitation. Package. Recommended Use Dilution: 1:20 with water
Formulation F-768

Heavy Duty Alkaline Degreaser

Monateric EH aids in the removal of oily soils without emulsification. It easily displaces oily soils from hard surfaces and keeps them from redepositing.

<u>Ingredients:</u>	<u>Wt%</u>
Water	65.0
Sodium Hydroxide (50%)	20.0
Sodium Metasilicate (Pentahydrate)	3.0
Monateric EH	10.0
Nonoxynol-10	2.0

Procedure:

Add ingredients in the order listed with agitation. Package. Recommended Use Dilution: 1:20 with water.
Formulation F-769

Steam Cleaner

Mona NF-20 contributes the non-foaming and detergency properties in this formulation.

<u>Ingredients:</u>	<u>Wt%</u>
Water	65.00
Potassium Hydroxide	3.00
Sodium Metasilicate (Anhydrous)	10.00
Tetrapotassium Pyrophosphate	10.00
Mona NF-20	12.00

Procedure:

Add ingredients in the order listed with agitation.

Typical Properties:

Cloud Point: 75C
Krafft Point: <0C

Recommended Use Dilution: 4-6 oz./gal.
Formulation F-762

SOURCE: Mona Industries, Inc.: Suggested Formulations

Industrial and High Pressure Cleaners
Cleaner, Strongly Alkaline

<u>Ingredients:</u>	<u>Wt%</u>
Water	76.5
Cublen D 50	1.0
Tetrapotassium pyrophosphate	4.0
Caustic soda	0.6
Sodium metasilicate	4.9
Sulfetal 4105	4.0
Zusolat 1008/85	2.0
Phosfetal 201	2.0
Butyl glycol	5.0

Formula CT 06-13-01

Cleaner, Weakly Alkaline

<u>Ingredients:</u>	<u>Wt%</u>
Water	80.4
Cublen D 50	1.0
Tetrapotassium pyrophosphate	2.0
Triethanolamine	3.6
Sulfetal 4105	4.0
Zusolat 1008/85	2.0
Phosfetal 201	2.0
Butyl glycol	5.0

Formula CT 06-13-02

Cleaner, Strongly Alkaline (Phosphate-Free)

<u>Ingredients:</u>	<u>Wt%</u>
Water	80.5
Cublen D50	1.0
Sodium metasilicate	4.9
Caustic soda	0.6
Sulfetal 4105	4.0
Zusolat 1008/85	2.0
Phosfetal 201	2.0
Butyl glycol	5.0

Formula CT 06-13-03

Cleaner, Weakly Alkaline (Phosphate-Free)

<u>Ingredients:</u>	<u>Wt%</u>
Water	80.4
Cublen D 50	1.0
Trisodium citrate	2.0
Sulfetal 4105	4.0
Zusolat 1008/85	2.0
Phosfetal 201	2.0
Butyl glycol	5.0
Triethanolamine	3.6

Formula CT 06-13-04

SOURCE: Zschimmer & Schwarz GmbH & Co.: General Formulations