

APTech Group Blended Solid-Concentrate Products Are Manufactured Using The Twelve Principles of Green Chemistry*

1. Prevent waste: Design chemical syntheses to prevent waste, leaving no waste to treat or clean up.

- *APTech Group products are designed to be used in their entirety; both the container and shipping carton are recyclable.*
- *No fillers, or other product modifiers, are added to APTech Group products.*
- *APTech Group manufacturing process produces no byproduct; only rinse water is used to clean production equipment.*
- *“Sticks” products – frequently used in start-up, lay-up, or catch-up situations – are packaged in water soluble bags and require no operator contact with the product.*

2. Design safer chemicals and products: Design products to be fully effective, yet have little or no toxicity.

- *APTech Group products use state-of-the art chemical technology to provide the same or better scale prevention, corrosion protection, microbial control, and fouling minimization found in liquid equivalents.*
- *Using APTech Group products will allow the facility to maximize energy, waste and chemical dollar savings, while minimizing impact to the environment, employees and customers of the facility.*
- *APTech Group products are designed to provide the following safety benefits:*
 - *No storage of hazardous liquid chemicals, eliminating risk and liability issues.*
 - *No potential for chemical contact with the employees, and customers of the facility.*
 - *No noxious odors, as are often present with liquid chemicals.*
 - *The APTech Group process allows for 100% use of the product. Once it is completely used, the container can be recycled.*
 - *No triple rinsing of 55 gallon drums or potential for unwanted disposal of toxic products.*

3. Design less hazardous chemical syntheses: Design syntheses to use and generate substances with little or no toxicity to humans and the environment.

- *In most liquid water treatment chemicals, substantial amounts of hazardous caustic must be added to maintain solubility of the components. APTech Group products do not require this addition.*

4. Use renewable feedstocks: Use raw materials and feedstocks that are renewable rather than depleting. Renewable feedstocks are often made from agricultural products or are the wastes of other processes; depleting feedstocks are made from fossil fuels (petroleum, natural gas, or coal) or are mined.

- *APTech Group products are packaged in renewable containers, including the shipping cartons.*

5. Use catalysts, not stoichiometric reagents: Minimize waste by using catalytic reactions. Catalysts are used in small amounts and can carry out a single reaction many times. They are preferable to stoichiometric reagents, which are used in excess and work only once.

- *During the manufacturing process, there are no stoichiometric reagents used. The only catalysts required are heat and cooling during the process. No waste is produced in the process.*

6. Avoid chemical derivatives: Avoid using blocking or protecting groups or any temporary modifications if possible. Derivatives use additional reagents and generate waste.

- *Production of the APTech Group products does not require the addition of binders or supplemental caustics to enhance solubility of the product.*



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7. Maximize atom economy: Design syntheses so that the final product contains the maximum proportion of the starting materials. There should be few, if any, wasted atoms.

- *All of the raw materials added to APTech Group products are utilized and no by-products or other forms of waste are produced in production or at the point of application.*

8. Use safer solvents and reaction conditions: Avoid using solvents, separation agents or other auxiliary chemicals. If these chemicals are necessary, use innocuous chemicals.

- *No solvents or auxiliary chemicals, such as acids or caustics are used in the production of APTech Group products.*

9. Increase energy efficiency: Run chemical reactions at ambient temperature and pressure whenever possible.

- *APTech Group products are designed to be utilized at ambient temperatures, including normal “tap” water temperatures for the dissolving action.*
- *Dissolving pressures are regulated and controlled through the feeder, using normal city water pressures.*

10. Design chemicals and products to degrade after use: Design chemical products to break down to innocuous substances after use so that they do not accumulate in the environment.

- *Most of the components utilized in the APTech Group products are biodegradable.*

11. Analyze in real time to prevent pollution: Include in-process real-time monitoring and control during syntheses to minimize or eliminate the formation of byproducts.

- *APTech Group products are designed to be tested and controlled using the same test kits, controls, and feed activation systems as those used in feeding and controlling liquid chemicals.*
- *On-line monitoring of system cycles, feed activated by demand and other types of feed and control are the same as those utilized with liquid chemicals.*
- *Because of the lower solution strengths when APTech Group products are dissolved on-site, overfeed or underfeed of the products is seldom an issue when proper delivery techniques are applied.*

12. Minimize the potential for accidents: Design chemicals and their forms (solid, liquid, or gas) to minimize the potential for chemical accidents including explosions, fires, and releases to the environment.

- *APTech Group products are among the safest chemicals available for use in facilities operations.*
 - *A case of APTech Group products, weighing less than 50 lbs., will deliver as much active chemicals as 30-100 gallons of a liquid (depending on the manufacturers' solution strength). A 55 gallon drum typically weighs over 500 lbs. If all of the current liquid water treatment products were replaced with APTech Group solid water treatment products, the carbon footprint reduction would be equivalent to removing 52,000 automobiles from US highways, per year.*
 - *In addition, roadways and waterways would be safer from the potential of hazardous chemical spills during transportation of the products.*
 - *In many facilities, a 5 gallon container of liquid chemicals is transported throughout the facility to apply small make-up amounts at the point of application. These containers typically weight 45-50 pounds which is not an easy weight to manage. The potential for back injuries is significant, when measured against transporting the APTech Group solid sticks products that weigh 1 lb. or less, with no potential for spillage.*

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