Water Quality AQUATEC ENGINEERING
THE WATER SPECIALIST
PT. AQUATEK ENGINEERING

+ 62 811 3037 533
aquatek.bryan@gmail.com
Ruko Bandar Mas Blok E No. 10

Chemical Compatibility and Impact Analysis of Sulfuric Acid and Aqua Shield 630

Potential Reactions

1. Severe Acidification and Chemical Destabilization

The introduction of concentrated sulfuric acid into Aqua Shield 630, which contains polymeric scale inhibitors and corrosion control additives, will result in an abrupt decrease in system pH. This extreme acidification can destabilize polymer chains through protonation and partial hydrolytic degradation, causing the loss of their dispersant and scale-inhibiting functionality. As a result, the formulation may no longer perform its intended role within industrial water systems and instead behave as a chemically aggressive solution.

2. Thermal Effects and Localized Exothermic Phenomena

Sulfuric acid exhibits a highly exothermic hydration and dilution behavior. When mixed with an aqueous polymer-based product such as Aqua Shield 630, localized heat generation may occur, especially if mixing is rapid or uncontrolled. This temperature rise can accelerate polymer breakdown, increase vapor formation, and elevate the risk of secondary hazards such as splashing, aerosolization of acidic mist, or degradation of container materials.

3. Enhanced Corrosivity Toward Metallic Infrastructure

The combined mixture is expected to exhibit corrosive characteristics that exceed those of Aqua Shield 630 alone. Sulfuric acid aggressively attacks carbon steel and other common metals, while the acidic environment may suppress the protective corrosion-inhibition mechanisms of the formulation. Consequently, pipelines, pumps, heat exchangers, and storage vessels may experience accelerated corrosion rates, leading to material thinning, leaks, or catastrophic equipment failure.

4. Increased Occupational and Environmental Hazard Profile

From a health and safety perspective, the mixed solution presents a significantly elevated risk. Acidic vapors or splashes may cause severe chemical burns to skin and irreversible eye damage. Additionally, the mixture may pose heightened environmental toxicity if released, as low pH effluents can disrupt aquatic ecosystems and mobilize heavy metals from surrounding materials or sediments.

Mandatory Control Measures

1. Immediate Isolation and Process Shutdown

Upon identification of unintended mixing, all associated operations should be halted immediately. The affected system must be isolated to prevent further circulation of the corrosive mixture. Valves should be closed, and energy sources such as pumps or heaters must be shut down to minimize pressure, temperature escalation, and system-wide contamination.

+ 62 811 3037 533
aquatek.bryan@gmail.com
Ruko Bandar Mas Blok E No. 10

2. Controlled Neutralization and Chemical Stabilization

Neutralization should only be conducted by trained personnel using appropriate alkaline agents (e.g., diluted sodium bicarbonate or sodium carbonate solutions), added slowly and under controlled conditions. Continuous monitoring of temperature and pH is essential to prevent runaway reactions. Direct disposal without neutralization is strictly inadvisable due to corrosivity and environmental risk.

3. Comprehensive Personal Protective Measures

All personnel involved in response activities must wear full chemical-resistant personal protective equipment, including acid-resistant gloves, face shields, chemical splash goggles, protective suits, and suitable respiratory protection if vapors are present. Access to emergency eyewash stations and safety showers must be ensured prior to any intervention.

4. Assessment of Equipment Integrity and System Decontamination

Following stabilization, all exposed equipment should undergo thorough inspection for signs of corrosion, polymer fouling, or structural compromise. Flushing with neutral or mildly alkaline water may be required to remove residual acidity and degraded polymers. Components exhibiting damage should be repaired or replaced before recommissioning.

5. Incident Documentation and Preventive Review

The incident must be formally documented, including root cause analysis, quantities involved, response actions, and observed impacts. Based on findings, procedural revisions such as improved chemical segregation, clearer labeling, enhanced training, or automated interlocks should be implemented to prevent recurrence and ensure long-term operational safety.