

Riboflavin Testing

Purpose

To test Clean in Place (CIP) spray patterns in stainless steel process vessels for completeness of spray coverage. The tanks may contain an agitator, vortex breaker, nozzles, man-way, fittings, projections, etc., which could create spray “shadows.” These shadowed areas must all be cleaned.

Scope

The pattern testing of all CIP devices installed in vessels requiring documented proof of cleanability.

Background

A fluorescent dye solution is sprayed on the interior of process tanks and the CIP system cycled to study the spray patterns and cleaning effectiveness.

Materials and Equipment

- Riboflavin Powder – Eastman Kodak #EK 1177112 Riboflavin Orange Powder (reagent grade) or equivalent.
- Long wavelength UV lamp in a suitable fixture to insert into various tanks.
- Water with a maximum of 30 PPM chloride (plant water) or 1.0 meg-ohm cm (de ionized water).
- CIP supply pump capable of supplying water at 40 psi [2.7 Bar (g)].
- Water tank and sufficient water to perform tests.
- Riboflavin solution spray device, capable of producing a fine mist spray.
- Calibrated pressure gauge(s).
- Calibrated flow meter(s).

General Requirements

- Tank shall be mounted in the final installed position.
- This test procedure shall be performed after polishing and /or electro-polishing of the tank.
- All openings shall be plugged or capped with the proper gaskets in place. All components shall be constructed of stainless steel, PVC, or brass.
- CIP system shall include a manual flow control valve, flow meter, and pressure gauge at each CIP manifold inlet.
- Tank shall be rinsed and dried prior to initiating testing.

Dye Preparation

- Mix one gram of riboflavin with ten liters of water in a clean polyethylene container to prepare a 100ppm solution.
- Transfer an appropriate amount of dye solution to a suitable hand atomizer.

Set-up

- Ensure tank is positioned in its operating orientation in the test bed and seal all tank openings with the proper caps and gaskets. Clear caps may be used to allow visual observation of the CIP process.
- Verify that the tank is clean and has been rinsed and dried.
- Verify that cleaning devices, spray balls, spray wands or bayonets are properly installed.

Pre-test Procedure

- Visually inspect the interior of the tank under illumination by the UV lamp.
- Record the results of this inspection on the CIP pattern Test Form.

Dye Application

- Before entering tank observe all confined space safety regulations.
- Enter tank and spray the entire interior surface of the tank with dye, including the man-way cover area, upper head space, nozzle projections, and tri-clamp connections up to cap/clamp areas.
- Exit tank without touching any sprayed surface.
- Inspect the interior of the tank, illuminated with UV lamp to ensure complete coverage (dye will fluoresce with a bright green color under UV illumination).
- Re-spray any areas that do not have complete coverage.