OPTIDOSE™ 2000 and OPTIDOSE 3100 Traceable Polymers

Description

Maintaining a minimum concentration of an effective dispersant polymer is crucial in an alkaline cooling water treatment program. The problem is knowing exactly how much polymer is available in the cooling water to combat fouling and corrosion of heat transfer equipment. Many years of research and effort have gone into the development of a method for tracing the concentration of polymers.

Dow has made a tremendous advance in the ability to understand and control fouling in a cooling water system by creating two new traceable polymers, OPTIDOSE™ 2000 copolymer and OPTIDOSE 3100 terpolymer. The OPTIDOSE polymers are tagged so that a simple and inexpensive field test may be used to determine the amount of free polymer in the cooling water. Use of the OPTIDOSE system (polymer and test kits) gives the end user a greater understanding of the cooling water chemistry and the ability to control the level of free polymer. Potentially disastrous fouling situations may be averted before they occur to maintain heat transfer at maximum levels.

Advantages of OPTIDOSE™ Traceable Polymers

Feature	Benefit
Assure polymer concentration is at or above minimum required levels	Avoid potential fouling situations and maintain maximum heat transfer Minimize cleanouts over time
Optimize dosage of polymer product	Cost savings by avoiding overfeeding
Measure free polymer level, not total added	Better control of the working level of polymer to allow maximum program efficiency
Simple, inexpensive, easy-to-perform field test	Minimize technician training, time, effort and expense
Test is specific to OPTIDOSE polymers only	Precise determination of OPTIDOSE polymer concentration under varying water conditions

Predict and Avoid Fouling Situations

The traceable polymer system will help predict and guard against potential fouling and corrosion situations in alkaline cooling water. This has been proven by an extensive battery of tests that also serve to demonstrate the high performance of OPTIDOSE™ polymers.

Dow laboratories evaluated and compared OPTIDOSE polymers to their untagged equivalents in two independent cooling tower pilot systems which simulate both large and small cooling towers. The polymers were evaluated in both stabilized phosphate and allorganic treatment systems. The tests were conducted over seven- to ten-day periods, and conditions were varied to mimic actual operating situations, including underfeeding to deliberately cause fouling conditions. The resulting data show clearly that monitoring the free polymer level in the system provides valuable information which will allow an operator to maintain control, minimize fouling situations, and maximize heat transfer capability in heat exchangers and other equipment.

Predict and Avoid Fouling Situations (Cont'd)

The pilot plant tests demonstrate what happens when a cooling system gets out of control. The testing began with a controlled addition of polymer to the system to reach steady state, and then the polymer additive was suddenly stopped (simulating a change in makeup water, the addition of particulate load to the system, failure of a feed pump, etc.) to upset the stability of the system.

The first test simulated use of a stabilized phosphate system containing OPTIDOSE™ polymer (8 ppm feed rate) without tracing. Levels of free polymer were monitored for information only. As the test progressed and stability was lost, there was no observed change in the system until scaling started and the heat transfer (% Uc) began to decrease. At that point, the polymer feed was restarted with a large slug dose, and another slug was added the next day, but it was too late to undo the fouling which had occurred. Heat transfer remained significantly below 100%.

The second pilot run utilized OPTIDOSE traceable polymer (8 ppm feed rate) with periodic testing and laboratory analysis of free polymer levels. Because the system was being tested every day, the decrease in free polymer was immediately detected after system stability was interrupted. The free polymer level dropped from about 8 ppm to 2 ppm. Restarting the polymer feed along with a single slug dose of 8 ppm brought the free polymer back to desired levels without adversely impacting heat transfer. In the exact same way, use of the traceable polymer can give an operator the detailed information necessary to avoid fouling situations and keep the cooling system operating at peak efficiency.

The pilot tests proved that if free polymer in the system drops below 2 ppm, fouling occurs within one to two days, probably due to formation of particles that accelerate the removal of remaining free polymer. Therefore consistent use of the OPTIDOSE system (polymers and test kit) can help operators to identify potential fouling situations and increase polymer dosage to avoid problems. Results of pilot tests using the stabilized phosphate system are shown in Figures 1a and 1b for OPTIDOSE 2000 and Figures 2a and 2b for OPTIDOSE 3100. Figures 3a and 3b and Figure 4a and 4b show similar plots for the all-organic program, run with a polymer feed rate of 5 ppm. No slug feeds were necessary in the all-organic tests because of the short system half-life.

Predict and Avoid Fouling Situations (Cont'd)

FIGURE 1a.

POLYMER UNDERFEEDING DISCOVERED TOO LATE (OPTIDOSE 2000/STABILIZED PHOSPHATE PROGRAM)

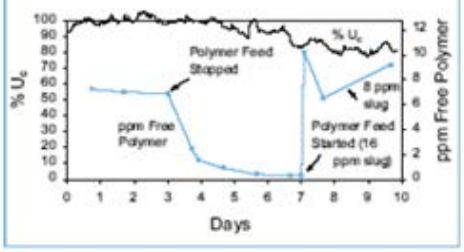


FIGURE 1b.

POLYMER UNDERFEEDING DISCOVERED BEFORE FOULING OCCURS (OPTIDOSE 2000/STABILIZED PHOSPHATE PROGRAM)

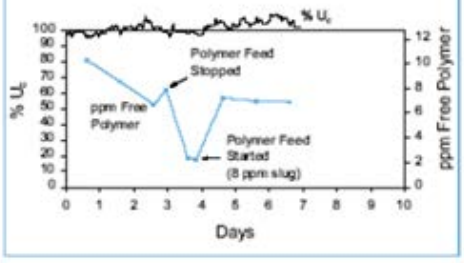


FIGURE 2a.

POLYMER UNDERFEEDING DISCOVERED TOO LATE (OPTIDOSE 3100/STABILIZED PHOSPHATE PROGRAM)

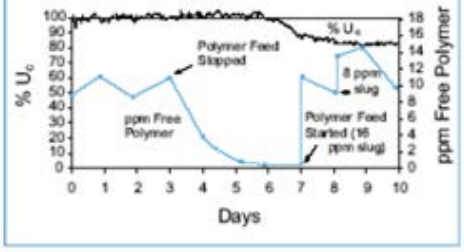


FIGURE 2b.

POLYMER UNDERFEEDING DISCOVERED BEFORE FOULING OCCURS (OPTIDOSE 3100/STABILIZED PHOSPHATE PROGRAM)

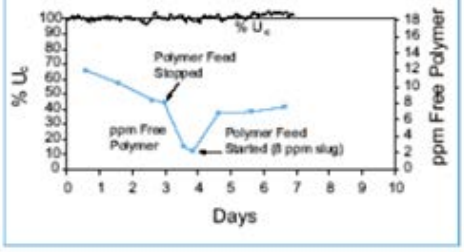


FIGURE 3a.

POLYMER UNDERFEEDING DISCOVERED TOO LATE (OPTIDOSE 2000/ ALL-ORGANIC PROGRAM)

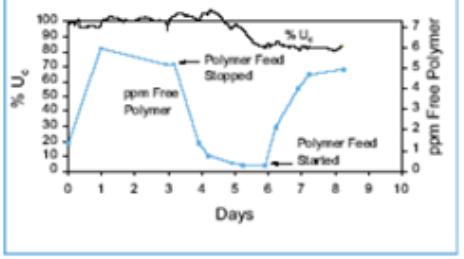
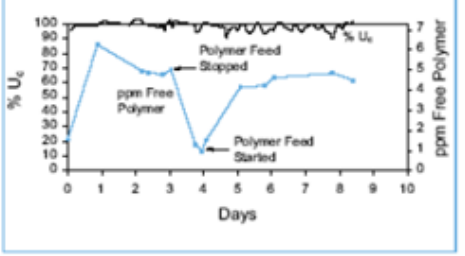


FIGURE 3b.

POLYMER UNDERFEEDING DISCOVERED BEFORE FOULING OCCURS (OPTIDOSE 2000/ ALL-ORGANIC PROGRAM)



Predict and Avoid Fouling Situations (Cont'd)

FIGURE 4a.

POLYMER UNDERFEEDING DISCOVERED TOO LATE (OPTIDOSE 3100/ ALL-ORGANIC PROGRAM)

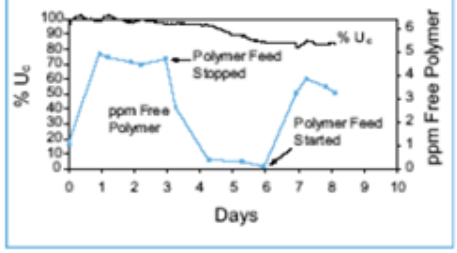
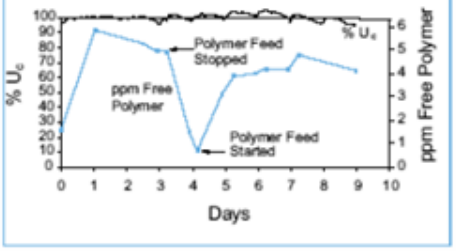


FIGURE 4b.

POLYMER UNDERFEEDING DISCOVERED BEFORE FOULING OCCURS (OPTIDOSE 3100/ ALL-ORGANIC PROGRAM)



Properties

Typical properties of OPTIDOSE™ 2000 and OPTIDOSE 3100 are shown in Table 1. The physical properties are identical to those of their untagged counterparts ACUMER™ 2000 and ACUMER 3100.

Typical Physical Properties

Table 1

These properties are typical but do not constitute specifications

	OPTIDOSE™ 2000	OPTIDOSE 3100
Appearance	Clear solution	Clear solution
Total solids, (%)	43	43.5
Active solids, (%)	39.5	39.5
pH	4.2	2.5
Molecular weight*	4500	4500
Density, lbs./gal. at 25°C (g/cc)	10.1 (1.21)	10 (1.2)
Brookfield viscosity, mPa.s/cps at 25°C	100	200
Lbs (Kg) NaOH (50%) to Neutralize 1 lb. (kg) of as-is product	0.19	0.27

*Measured by aqueous GPC and reported as acid form

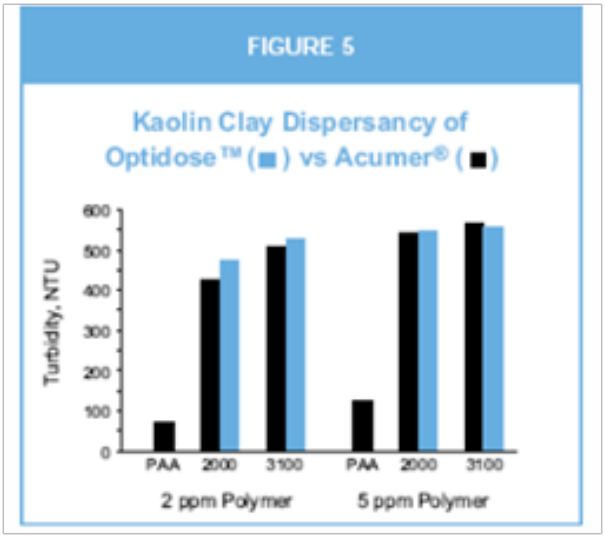
Tagged Versus Untagged Polymers

Numerous tests have been done by Dow laboratories to prove that OPTIDOSE™ tagged polymers are equivalent in every way to their untagged counterparts, ACUMER™ 2000 and ACUMER 3100. The following is a summary of some of the test results:

Kaolin Dispersion

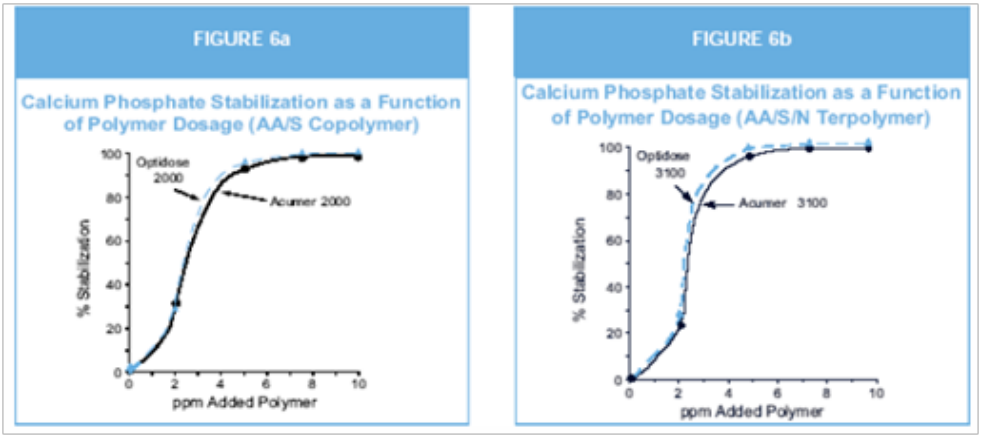
An effective water treatment polymer will maintain silt in suspension to prevent fouling. A comparison of silt dispersancy of OPTIDOSE™ and ACUMER™ polymers was done by measuring the kaolin clay dispersancy. The tagged and untagged versions of the polymer were indistinguishable, as shown in Figure 5.

Tagged Versus Untagged Polymers



Calcium Phosphate Stabilization

To minimize corrosion and prevent fouling in alkaline cooling water systems, a polymer must maintain small particle size by stabilizing potential foulants such as calcium phosphate. Tests comparing the calcium phosphate stabilization of the tagged and untagged polymers showed that performance is virtually identical. See Figure 6a and 6b for the results.



Stability

Ongoing studies have proven OPTIDOSE™ polymers to be stable at varying conditions of pH, temperatures, and exposure to oxidizing biocides. OPTIDOSE 2000 and OPTIDOSE 3100 maintained stability in tests at 50°C and pH 12.5 or pH <1 for more than 12 weeks. Performance and traceability are not impacted by exposure to a 4 ppm sodium hypochlorite solution.

Handling Precautions

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

Storage

Store products in tightly closed original containers at temperatures recommended on the product label.

Disposal Considerations

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow Technical Representative for more information.

Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

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