

OPTIDOSE™ TRACEABLE POLYMER SYSTEM TAGGED POLYMER TECHNOLOGY

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.

Rohm and Haas has made a tremendous advance in the ability to understand and control 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

Assure polymer concentration is at or above minimum required levels

Optimize dosage of polymer product

Measure free polymer level, not total added

Simple, inexpensive, easy-to-perform field test

Test is specific to Optidose polymers only

Benefit

Avoid potential fouling situations and maintain maximum heat transfer

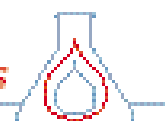
Minimize cleanouts over time

Cost savings by avoiding overfeeding

Better control of the working level of polymer to allow maximum program efficiency

Minimize technician training, time, effort and expense

Precise determination of Optidose polymer concentration under varying water conditions



PREDICT AND AVOID FOULING SITUATIONS

The traceable polymer system will 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 assure users that Optidose polymers will perform at peak levels.

Optidose polymers were evaluated and compared 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 all-organic 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.

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 (% U_c) 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) will enable 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.

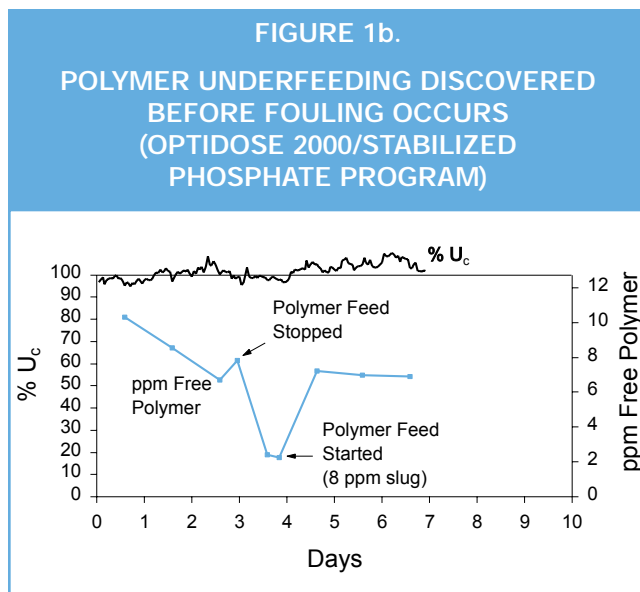
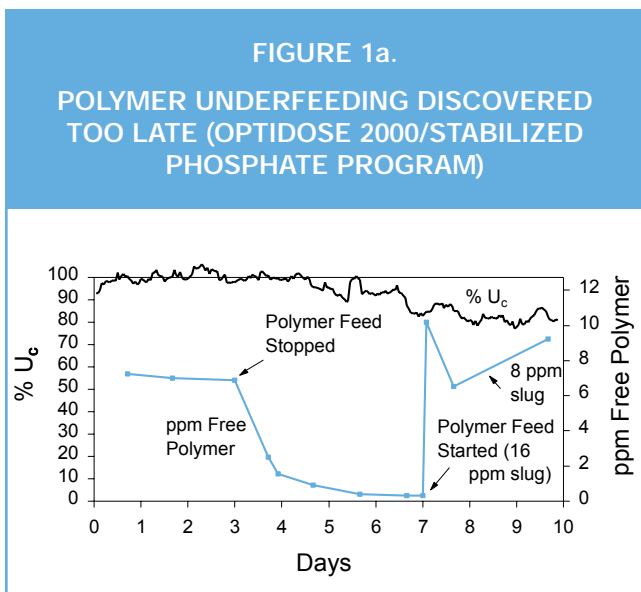


FIGURE 2a.

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

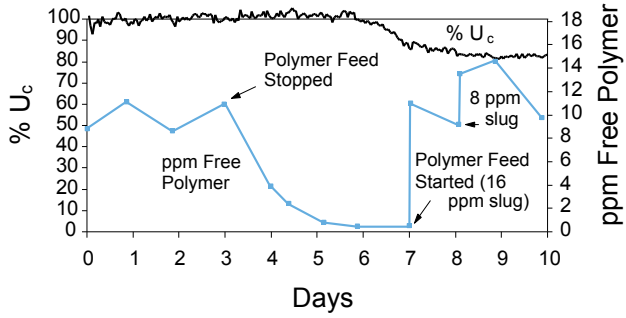


FIGURE 2b.

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

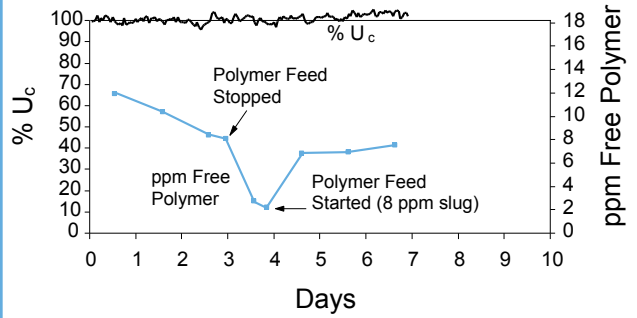


FIGURE 3a.

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

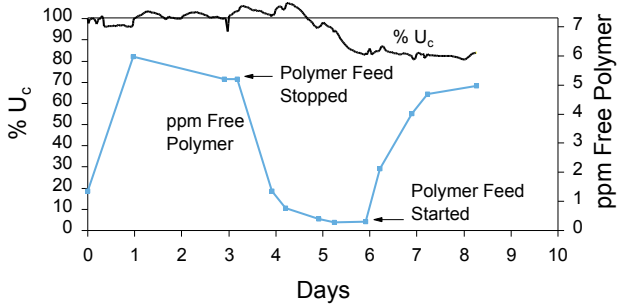


FIGURE 3b.

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

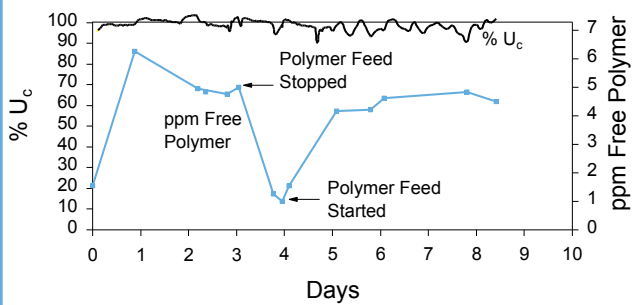


FIGURE 4a.

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

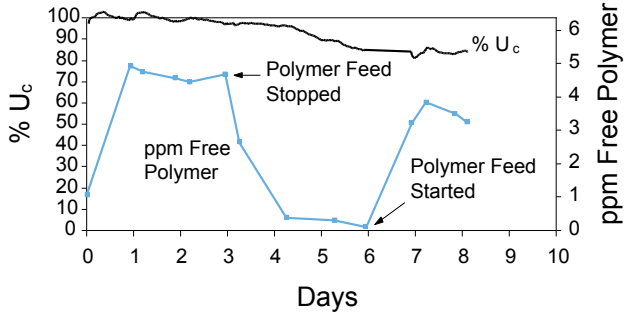
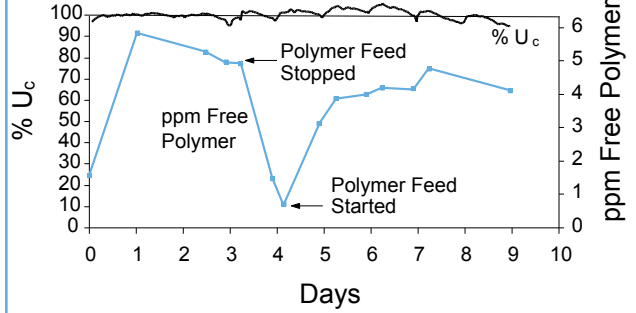


FIGURE 4b.

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.

TABLE 1

TYPICAL PHYSICAL PROPERTIES OF OPTIDOSE TAGGED POLYMERS
(these 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, cps. at 25°C	100	200
Lbs. NaOH (50%) to Neutralize 1 lb. of as-is product	0.19	0.27

* Measured by aqueous GPC and reported as acid form.

TAGGED VERSUS UNTAGGED POLYMERS

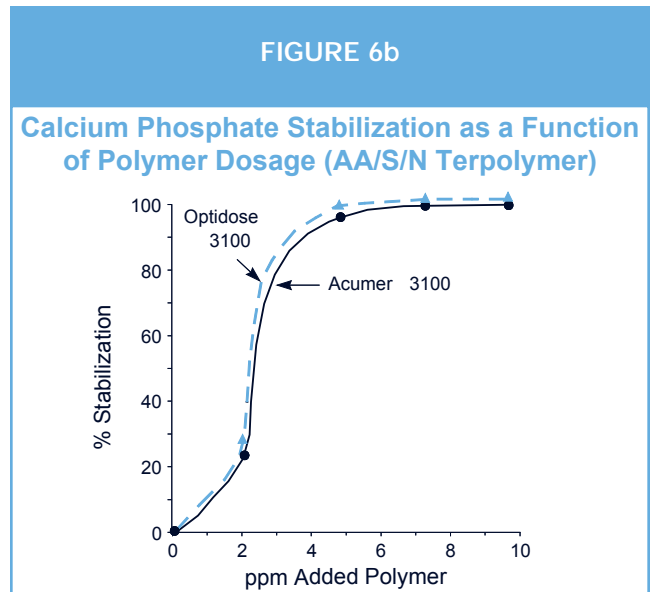
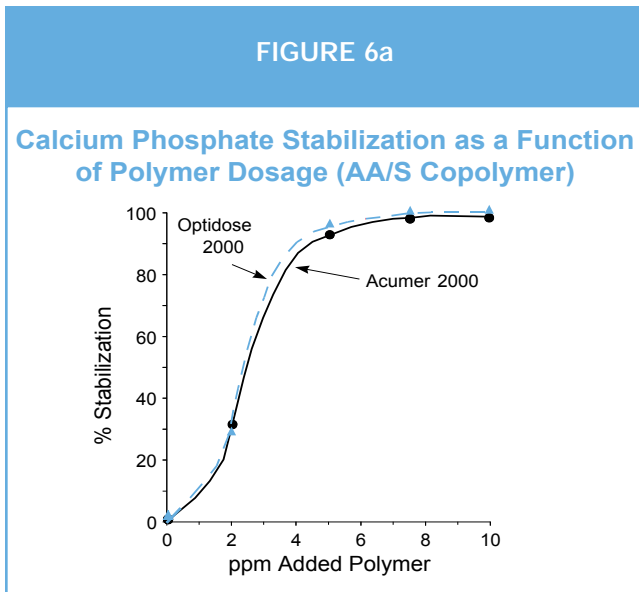
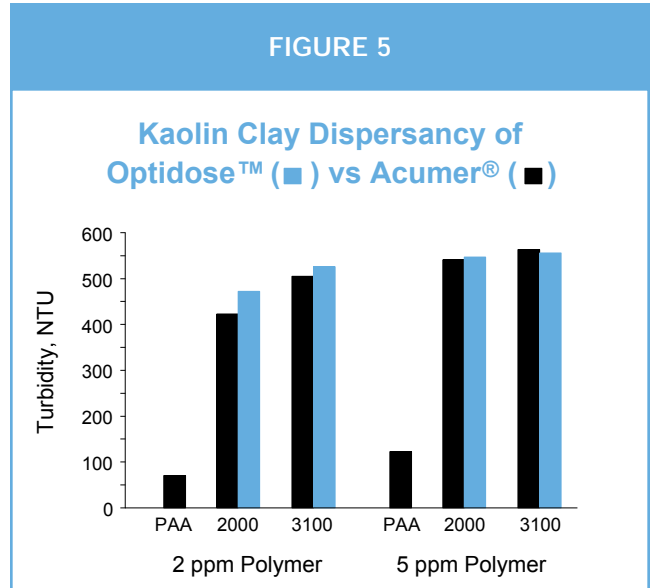
Numerous tests have been done to prove that Optidose tagged polymers are equivalent in every way to their untagged counterparts, Acumer 2000 and Acumer 3100. The following is a summary of some of the test results:

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.

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.

MATERIAL SAFETY DATA SHEETS

Rohm and Haas Company maintains Material Safety Data Sheets (MSDS) on all of its products. These contain important information that you may need to protect your employees and customers against any known health and safety hazards associated with our products. We recommend you obtain copies of MSDS for our products from your local Rohm and Haas technical representative or the Rohm and Haas Company. In addition, we recommend you obtain copies of MSDS from your suppliers of other raw materials used with our product.

Under the OSHA Hazard Communication Standard, workers must have access to and understand MSDS on all hazardous substances to which they are exposed. Thus, it is important that appropriate training and information be provided to all employees and that MSDS be available on any hazardous products in their workplace.

For additional information, a sample, a Material Safety Data Sheet, or to have a technical representative call for an appointment, please call: **1-800-223-3897**.

United States

Rohm and Haas Company
100 Independence Mall West
Philadelphia, PA 19106
1-800-223-3897

Sales Office

Rohm and Haas Company
Technology Park I
25111 Country Club Blvd.
Suite 220
North Olmsted, OH 44070
(216) 777-8666
800-887-5755

Canada

Rohm and Haas Company
2 Manse Road
West Hill Ontario
M1E 3T9
(416) 284-4711

Europe

Rohm and Haas Company
Lennig House
2 Mason's Avenue
Croydon CR9-3NB
Surrey, England
(181) 686-8844

NorsoHaas SA*
10 Av. de Bergoide
F60550 Verneuil en Halatte
France
(33) 44-61-78-78

Rohm and Haas Company
Via della Filanda
Milan
20060 GESSATE
(39-2) 95250-1

Latin America

Rohm and Haas
Latin American Region
2600 Douglas Road
Suite 1100
Coral Gables, FL 33134
(305) 447-3600

Rohm and Haas Company
Alameda Purus, 105
Alphaville, 06454-030
Barueri-SP, Brazil
(55-11) 7269-9000

**Some Acumer polymers are sold under the Noramer trademark in Europe.*

Rohm and Haas Mexico
Paseo de los Tamarindos No.
400-A
7th Floor
Col. Bosques de las Lomas
Mexico, D.F. 05120
(525) 728-6666

Pacific Region

Rohm and Haas Company
Kaisei Building
8-10 Azabudai 1-chome
Minato-ku, Tokyo Japan
106
(81-3) 3583-9461/2

Rohm and Haas Company
Room No. 802
Poong Lim Building
823 Yeoksam-dong
Kangnam-ku, Seoul, Korea
(82-2) 555-7600

Rohm and Haas Company
391A Orchard Road #23-07
Ngee Ann City, Tower A
Singapore 238873
(65) 735-0855

Internet: www.rohmhaas.com



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