

DEAERATOR PERFORMANCE TESTING ... A GUIDELINE
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PURPOSE

ANSI/ASME Performance Test Code (PTC) 12.3-1977 provides both mandatory and permissive rules and test procedures to be used to determine whether performance guarantees by the manufacturer of the deaerator equipment have been met. This guideline publication is not intended to duplicate material contained in PTC 12.3-1977. It is intended only to clarify how to do testing to verify oxygen levels in the water in accordance with PTC 12.3-1977.

This guideline publication is a product of the Deaerator Manufacturers Group of the American Boiler Manufacturers Association (ABMA). It is offered as guidance to allow the owner, the engineer, the contractor and the manufacturer to reach a method for determining if a deaerator is performing as intended. This guideline is intended to apply to any type of deaerator or system which is intended to mechanically deaerate boiler feed water. This guideline is intended to provide a simple, fool-proof method of performance testing, which can be performed in the field with readily available, reliable testing equipment.

The ABMA does not assume responsibility or liability for consequences arising from the implementation or failure to implement the guidance contained herein, and the contents of this guide should not be construed as an endorsement by the ABMA of any product or manufacturer. This guide is intended as a supplement to the manuals and counsel furnished by the equipment manufacturers, who should be consulted regarding specific operational, equipment or testing problems.

Readers should also consult the ABMA Online Bookstore at www.abma.com for additional material on this and other technical questions, and the ABMA Online Buyers Guide for a list of ABMA member companies involved with deaeration.

HOW IS DEAERATOR PERFORMANCE TESTED?

The deaerator test procedure should be agreed on by all parties prior to selection of the system or the procedure should be defined in the system specifications. The test procedure should define:

1. The testing equipment and test method used for the test.
 2. The location of the test.
 3. The time at which the test will be performed.
 4. The duration of the test period.
 5. The number of tests to be performed.
 6. The operating conditions during the test.
1. **The Test Equipment.** There are simple test kits available such as those offered by Chemetrics or Carmine-Indigo. Neither electronic nor online tests are acceptable.
 2. **The Location of the Test.** The system must be tested at the actual installation.
 3. **The Time of the Test.** The test should be performed after the system is completely installed and at a time when the conditions of the test procedures can be satisfied.
 4. **The Duration of the Test.** The test should be conducted after the system has been operating at steady state conditions for a period of at least four (4) hours before the sample for the test is drawn. The sample valve should be open for at least 30 minutes prior to collecting the sample for testing.

5. ***The Number of Tests to be Performed.*** Normally, one operating point is sufficient to determine if a system is performing properly. Normally, 100% of the system capacity is the appropriate operating point to use. If additional operating test points are required, the number should be defined prior to the purchase of the system.

If multiple operating points are to be tested, the system must be brought to the new operating point and operated at steady state conditions at the new operating point for at least four (4) hours prior to drawing the sample for test.

6. ***Operating Conditions for the Test.*** The test should be performed at steady state conditions, which are defined as:

- a. Load. Normally the system is operated at full capacity. If the customer would prefer to test the system at another operating point, that point should be defined in advance.
- b. Inlet Water Flow. The inlet water should be at a constant flow rate for at least four (4) hours before the test is run. This is normally the flow rate that corresponds to 100% of load. If the system is designed for 100% cold, fresh water make-up, the test should be run at this point. If the system is designed for a higher average input water temperature, the system should be tested with this flow rate.
- c. Discharge Water Flow Rate. The water should leave the deaerator at a constant rate which is equal to the load at the capacity at the chosen test point.
- d. Operating Pressure. The operating pressure should be constant for the period of the test. This includes the four-hour period prior to collecting the test sample. Constant pressure is defined as a variance of ½ psi on either side of the pressure set point.
- e. Vent. The vent must be opened to allow adequate steam to pass to vent the non-condensable gases that are released. The vent must be set at a constant point for the entire period of the test.
- f. Testing at Startup In Lieu of Actual Operating Conditions. If the system is tested at start-up of the boilers, the system should be tested with the designed (specified) inlet coming from fresh water make-up.
- g. Preparation for the Test.

1. The source of the sample for the test should be drawn from a sample point in the vessel. Alternately, the discharge piping of the boiler feed pump may be used, providing the pump recirculation piping can be turned off without damaging the pump.
2. Turn off all system recirculation lines (if applicable) for the duration of the test.
3. Turn off the oxygen scavenger at least 24 hours (operating hours) before the test is to be run.
4. Operate the deaerator at the output capacity desired for the test for a period of at least four (4) hours before the test is to be performed.

7. **Testing.** Perform the test with no more than five feet of stainless steel tubing with a stainless steel sample cooler and isolation valves on the inlet and outlet of the sample cooler. Testing shall be performed with the sample temperature at approximately 78°F. The sample should be read within five seconds of extraction from the system. Perform at least five tests at the operating condition chosen. Use the lowest test(s) to establish the actual level of performance. Tests which show higher levels of non-condensable gases are assumed to be contaminated and should be discarded.

These guidelines were developed by the Deaerator Manufacturers Product/Market Group of the American Boiler Manufacturers Association (ABMA). The contents of this document are offered

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Readers should also consult the ABMA Online Bookstore at <http://www.abma.com/> for additional material on this and other technical questions, and the ABMA Online Buyers Guide for those ABMA member companies involved in Deaeration and deaerating systems.

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