

DID YOU KNOW?

NO: 28

NOVEMBER 9, 2009

BOWIE DICK TESTING

The Basics

Several times each year, the Primus Service Department receives calls from the field asking for help in troubleshooting a sterilizer that has failed a Bowie Dick test. Below is a general discussion about the Bowie Dick test – what it tests for, precautions to take, and general instructions on how to run the test. At the end are some troubleshooting tips to help you reach root cause when confronted with a BD failure.

A Bowie Dick test is used to check for **proper chamber air removal** in **vacuum steam sterilizers** (commonly referred to as pre-vac or high-vac sterilizers). If the BD test passes, it tells the laboratory that there has been sufficient air removal to achieve required steam penetration into a standard load.

It is important to remember that Bowie Dick tests are not recommended for use in any other type of sterilizer!

The Bowie Dick test is designed to detect air pockets trapped within the sterilizer chamber. **One and only one** Bowie Dick test pack is to be run in an otherwise **empty sterilizer**.

Most hospitals routinely run one Bowie Dick test in each vacuum sterilizer each day. While not absolutely required, it is a good idea that the test be run at the same time each day after the sterilizer is warm. **It is important that the test not be run in a cold sterilizer**. If a sterilizer has not been used within an hour prior to doing the Bowie Dick test, the chamber should be preheated to operating temperature by running at least one empty chamber cycle. **A test run from a cold start may produce false failures**. The warm-up cycle will also ensure that any air is cleared out of the lines.

If a Bowie Dick test should fail, another Bowie Dick test should be run as a verification step. **If the second test also fails, the sterilizer should be put out of service** until the problem is identified and corrected.

Numerous manufacturers throughout the world make and sell BD tests directly to end users and through several distribution channels, including the Internet. Each manufacturer uses the same basic process of placing **heat sensitive inks** onto commercial **paper** in various **patterns**.

A Bowie Dick test **failure** is noted by **the lack of a total uniform change to the final color** as specified by the BD test manufacturer. See the example below.

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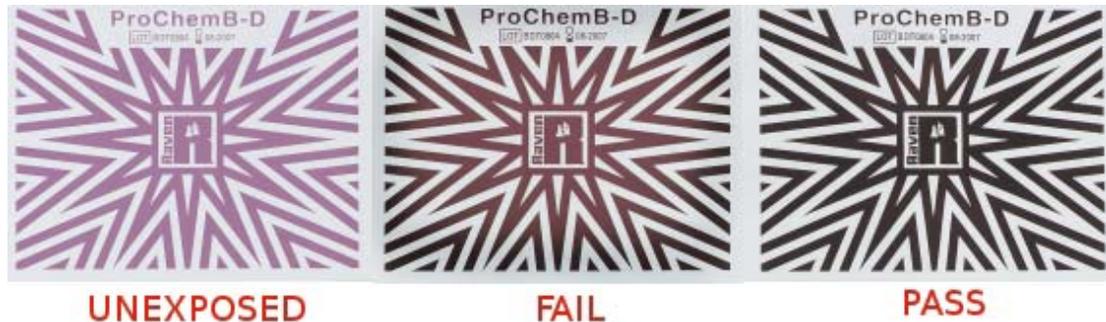
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According to The Association for the Advancement of Medical Instrumentation (AAMI) Standard ST46, a Bowie Dick test should be run following:

Installation of a new sterilizer

After relocation of a sterilizer

A sterilizer malfunction

A sterilizer process failure

Any major repairs

To verify the proper functioning of the sterilizer following any of the events listed above, three consecutive Bowie Dick tests should be run.

The Bowie Dick test should not be run for more than 4 minutes at 273 F. The instructions of the manufacturer of the BD test used must be followed. AMMI documents recommend an exposure time of 3 1/2 minutes. The operator must run the sterilizer cycle in accordance with the Primus operator manual. **When conducting the BD test cycle, the drying time may be omitted without affecting the test's outcome.** This will minimize the time the sterilizer is tied up for testing.

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Troubleshooting

There are two possible causes of a failed Bowie Dick test:

- 1) Air not completely removed by pre-vac pulses
- 2) Air leaking into chamber while under vacuum

Two cubic centimeters of air in a thirty cubic foot chamber will cause a Bowie Dick to fail, as evidenced by an egg-shaped light spot in the center of the test pattern.

The **first step** in troubleshooting is to verify that the vacuum system is performing properly.

- 1) Have cycle parameters been changed to reduce the number of pre-vacs or depth of pre-vacs?
- 2) Vacuum pump seal water temperature must be below 70 degrees F.
- 3) Water pressure to the ejector must be greater than 50 psig.
- 4) Check for foreign material in the ejector.

The **second step** is a quick inspection of the most common causes of chamber leaks.

- 1) Verify by independent test gauge that steam or air pressure to the seal gasket is set at 30-32 psig. Replace the gasket if worn or damaged. Use Dow Corning 111 silicone grease to lube the gasket.
- 2) Inspect check valves common to the chamber for wear, damage, or foreign material that could be preventing a proper seal.
- 3) Remove the air in filter and plug solenoid valve to verify that the valve is not leaking.
- 4) Inspect for a loose pressure transducer
- 5) Remove and plug the chamber gauge and tubing.
- 6) Verify that the RTD ferrule is not leaking.
- 7) **(While performing a vacuum test only!)** Remove and plug the chamber safety valve to verify that the valve is not leaking. **Replace the safety valve immediately and do not leave sterilizer unattended under any circumstances.**

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NOTE

Steam leaks to the chamber will not cause a Bowie Dick failure...only air leaks will!!!

The **third step** involves a chamber leak test.

Pipe fitting leaks (common during installation start-ups) often are due to the affects of transportation and handling. **Vacuum leaks and pressure leaks are not the same!** Looking for steam or condensate leaks while the chamber is pressurized is not a valid test for vacuum leaks.

A high resolution validated vacuum test gauge is recommended.

First, draw the chamber down to the maximum vacuum the system is capable of. Shut down the vacuum system and hold the chamber in vacuum. A vacuum loss greater than two (2) inches Hg in 20 minutes indicates a leak to the chamber through associated piping.

Plugging off upper and lower piping assemblies individually will help locate the leak

Locating and eliminating chamber leaks is arguably one of the most challenging activities in sterilizer service. Exercising patience and following a methodical plan generally results in the timeliest resolution.

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