

TECHNICAL BULLETIN

The Green Card

How can a small card work the same as a large Bowie-Dick test pack?

Scientific technology has allowed many products, for example, computers, cameras, and Bowie-Dick test packs to be reduced in size yet function better than the preceding products. The original Bowie-Dick pack consisted of cloth towels stacked 11 inches high. Disposable Bowie-Dick packs made of paper were invented in the early 1980's. They were 1% the size of the original towel packs. The new "Green Card" by SteriTec is the next step in that evolution. It is about 1% the size of current disposable Bowie-Dick packs.

How a Bowie-Dick pack works

Bowie-Dick packs typically hold a volume of air that the sterilizer must remove. This volume of air is held in a matrix of porous material, typically cloth or porous paper. The penetration of steam into the pack is documented through the use of an indicator sheet placed in the middle of the pack. The indicator sheet changes color upon contact with steam. If air remains in the center of the pack, steam will be prevented from penetrating and therefore, the center of the indicator sheet will be unchanged in color, or less changed than the perimeter of the test sheet. Heat energy from condensing steam contacts the indicator sheet as the steam penetrates the pack and causes the chemical reaction of the indicator ink to change color. In other words, the color change comes from the penetration of heat carried by the steam to the center of the pack. Most ink chemistries used in printing Bowie-Dick test sheets change color with heat energy from steam, not from steam itself.

Size

In the early 80's the size of disposable Bowie-Dick packs made with paper was reduced through the use of barrier layers. Barrier layers, made of plastic laminated paper, redirect the removal of air and the penetration of steam so that a small, flat pack can behave much like a large bulky towel pack. (U.S. Patent 4,579,715) The sensitivity of Bowie-Dick packs is related to the distance that air or steam must travel. Large cloth towels were used originally for this reason. When impermeable plastic laminated layers were added to packs made of paper, air and steam traveled further, thereby elevating their sensitivity to that of towel packs.

The Green Card

The Green Card contains a number of features not present in disposable test packs made with paper. The porous matrix that holds air is very compact. The material that is sandwiched in the middle of the Green Card is a high-grade blotter paper that is very porous. It allows air and steam to flow freely through all the interstices of the cellulose matrix. The benefits obtained from this feature are that a single layer of this material can now be used to form the porous mass needed for this test. The Green Card uses plastic layers on the top and bottom of the card to force the air and steam to flow to and from the edges of the porous layer, which enhances the sensitivity and allows a miniaturization of the test pack system.

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Sterilant Specific Ink Chemistry

To complete the explanation, the indicator ink chemistry used to print the Green Card is sterilant specific. Sterilant specific means that the ink actually reacts with steam as well as heat and exposure time. The color change from purple to green is caused by a high-energy hydration reaction. Water molecules from the steam attach themselves to the active ingredient in the indicator ink, causing the active ingredient to change color. Since water molecules and high heat energy are needed to cause this hydration reaction, any air around the ink chemicals will interfere, not only from the reduction in heat energy, but also from the reduction in water molecules available to cause the hydration reaction. This is a doubling of the forces that increase the sensitivity of the test card. The final result is a smaller test pack that is now a test card. In addition to these features, the indicator ink is printed directly onto the porous matrix substrate, thereby allowing the end-user to view the color change without opening a test pack and discarding the paper waste.

Performance notes

If small droplets of water spray are present in the sterilizer, they will fall on the card and will keep the chemistry cool in that location. A small white or light green spot may appear in the indicator ink directly under the small water droplet. If large water droplets are present, they could keep the test cool enough to show a slightly purple color directly under the large water spot. Should the user wish to ignore excessive water spray, the Green Card can be placed upside down in the holder with no ill effects on performance. This will place the water droplets on the opposite side of the Green Card, away from the indicator ink. If the sterilizer is normally set for a long dry time, the strong vacuum forces that are present in the dry cycle could affect the indicator chemistry. The indicator ink chemistry might become altered slightly and cause the green final color to turn brownish. It is recommended that dry time not exceed 5 minutes. Neither case described above will interfere with the function of the Green Card. A signal for the presence of residual air is a purple area in the center of the card.



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