



DPL-24 Features Overview

Differential Pressure Lamination is a process to adhere one thin flexible material to another material of varying thickness.

Vacuum evacuation, heat, and pressure are combined in one process to provide an airless environment where complete adhesion is assured.

The vacuum is displayed on a thermocouple sensing, computer calibrated, digital gauge located on the front panel.

The substrate is exposed to this Vacuum Dwell for a time determined by a precision digital timer.

At the end of the Vacuum Dwell, a preheated silicone rubber diaphragm descends onto the work-piece and drives the spring-mounted drawer mechanism into intimate contact with the lower heater platen.

The temperatures of both the upper and lower heat platens are controlled independently by digital, proportional, Temperature Controllers.

A positive pressure of up to 10 PSI is applied to the top of the diaphragm to bring the combined differential to nearly 25 PSI.

The Pressure Dwell is adjusted by a precision digital timer identical to that employed by the Vacuum Dwell.

Upon completion of a cycle, the drawer mechanism is retracted and the product is removed for further processing.

The entire process is governed by a microprocessor driven programmable controller.

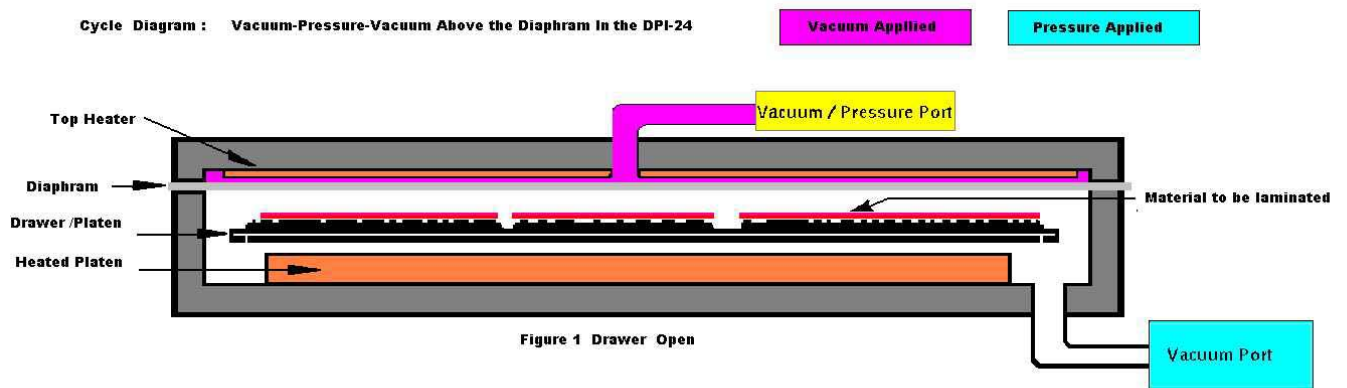
Programming modifications are available from the factory.

PRINCIPLES OF OPERATION

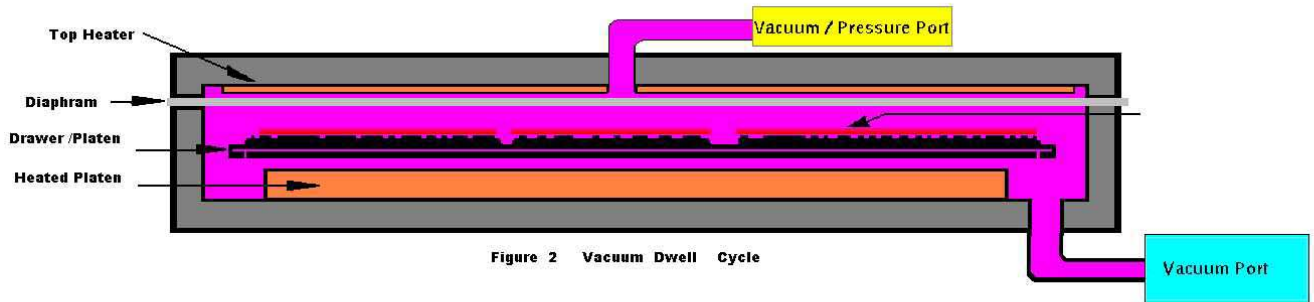
The operation of the DPL-24 Differential Pressure Laminator.

When the DPL-24 is turned on, two proportional controllers independently drive the top and bottom heaters to heat the diaphragm to the temperatures set on the front panel. After a brief warm-up time, the laminator is ready for use.

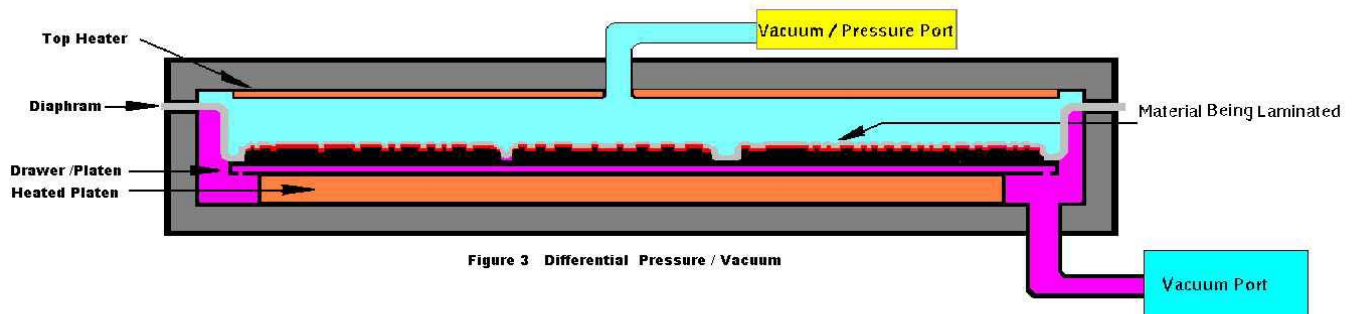
The drawer is pulled open to allow access to load the vulcanized rubber platen with materials ready for lamination. Products of differing thickness and geometries can be intermixed during a cycle if adequate “hold-down” techniques are employed. The layered material is placed on the platen mounted in the sliding drawer. When the drawer is closed, the platen is positioned in the vacuum chamber, and an O-ring seal on the drawer face contacts the opening in the vacuum / pressure vessel.



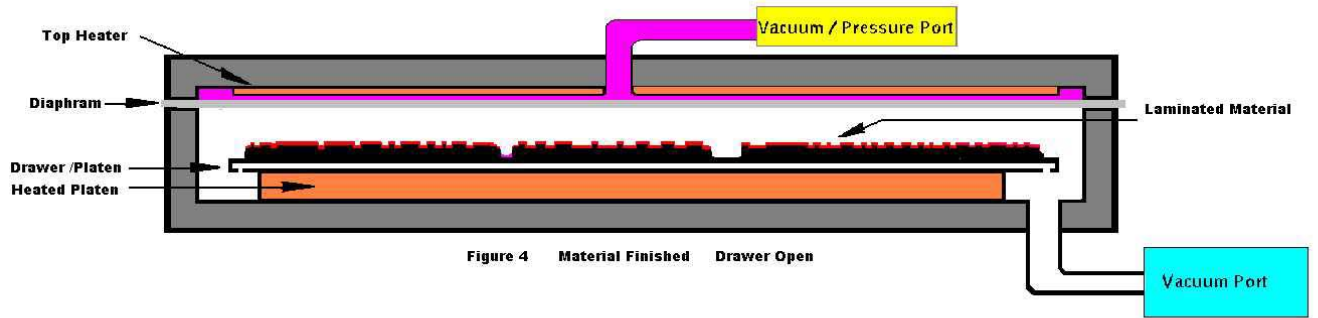
Before the beginning of the cycle there is a vacuum drawn above the diaphragm. Air at atmospheric pressure is in the bottom of the vessel, pushing the diaphragm upwards. As shown in **Figure 1**, the diaphragm is up above the material on the drawer platen. The drawer platen is spring loaded upwards to allow the drawer to be opened and closed.



When the cycle starts, vacuum is drawn on both ports, above and below the diaphragm. Utilizing a high volume vacuum pump, an end point approaching two Torr is achieved. This vacuum is displayed on a digital gauge located on the front panel. A programmable timer determines the vacuum dwell time before continuing to the next step **Figure 2**. It is important to note that this dwell time will allow air between the layers of material to be evacuated before the lamination pressure cycle begins, eliminating trapped bubbles. Because the vacuum is equal above and below the diaphragm, it does not move and does not contact the material in the drawer.



At the end of the Vacuum Dwell, positive air pressure at up to 10 PSI is applied to the port above the diaphragm bringing the pressure differential to nearly 25 PSI. See **Figure 3**. The preheated silicone rubber diaphragm descends onto the workpiece. This action drives the spring-mounted drawer platen into contact with the lower heater platen. Isostatic pressure is transferred to the material by the diaphragm. The stretching effect that occurs with roll type laminators is minimized. The flexible diaphragm conforms to the surface shape assuring positive contact between the layers, thereby eliminating voids. The pressure dwell time is controlled by another timer identical to the vacuum dwell timer.



At the end of the pressure dwell cycle, the top port is connected to the vacuum pump again, and the bottom port is vented to atmospheric pressure. As shown in **Figure 4**, this returns the diaphragm and drawer platen to their original positions and allows the drawer to be opened for unloading.