

## Using Pressure Decay Methodology to Detect Glovebox Failures

Page 6 - Article by Michael E. Cournoyer, Ph.D. and Stephen Schreiber  
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### The Glovebox Evolution

Page 16 - Article by Chris Bartlett, MBraun, Inc.

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# The Glovebox Evolution

By: Chris Bartlett, MBraun, Inc.



The glovebox evolution refers to new technologies incorporated in the production of gloveboxes to meet the demands of the marketplace. Glovebox manufacturers continually create new design features to offer customers more choices, better reliability, additional functionality and increased capability. New design features in the glovebox include PLC touch screen displays, automatic controls, enhanced gas purifiers, rapid transfer configurations, radius corner designs, advanced oxygen and moisture analyzers, innovative storage designs and integrated solution capabilities. New glovebox designs improve the quality, efficiency and reliability of the research being performed. Glovebox manufacturers continually evolve, offering complete turn key solutions that span all phases from the research phase up to the production phase. The glovebox manufacturer is now the solutions provider creating complete custom system solutions for any application.

The research performed inside the glovebox is only as good as the atmosphere it was created in. Meeting the high quality

demands of the controlled environment marketplace is the driving factor when designing a glovebox with optimum performance. New technologies in gas purification design offer larger column capacities that enhance glove box operations and allow greater functionality for the end user. Gas purification plays an important role in the ability of the glovebox to maintain a controlled environment. Emerging technologies in the purification of gas have created more user options opening the door to new capabilities in glovebox design. Gas purifiers come standard with touch screen displays allowing the user to regenerate the purifier with a simple touch of a button without using hand operated valves. The touch screen display allows more automated features that make using the glovebox simple and effective. The ability to maintain a controlled environment is the main function of the glovebox, and as technology grows, so will the capabilities of the glovebox.

Glovebox design incorporates a variety of sizes to support the application. Large complex gloveboxes can be found integrated into industrial production lines such as lithium batter-

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ies, high intensity discharge lamps, photovoltaic cells or alongside nuclear applications for tritium removal. Small standard size glove boxes are most often used for research and development in university laboratories. The demand in the glovebox market shows strong growth through increased development in specific applications. One application in particular is in thin film deposition. Depositing material like calcium, silver and gold onto wafers or thin film material under high

vacuum is widely used in many markets around the world. A large number of university laboratories and OEM companies have invested in gloveboxes integrated with thin film deposition chambers in the research and production of solar cells, OLED displays and thin film batteries. The MBraun MB -Evaporator glovebox pictured above is a perfect example of the design of a glovebox meeting the demands of the application. The glovebox system is equipped with a square style evaporator chamber, spin coater and Siemens PLC touch screen controller. The design of the MB Evaporator glovebox shows a direct correlation between an emerging technology (alternative energy, OLED display) and a glovebox designed to meet the research and production of that emerging technology. Glovebox manufacturers have the capability to provide deposition equipment for research purposes in-house or team up with leaders in the deposition equipment field to provide a highly technical and reliable turnkey system. Glovebox manufacturers



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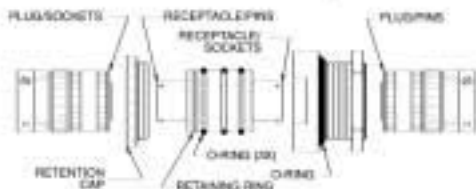
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# Glovebox Applications

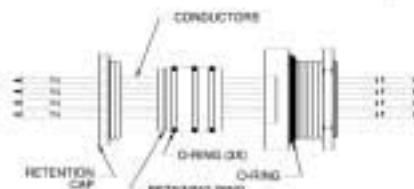
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## The Glovebox Evolution

have also taken the next step in providing complete OLED production lines with integrated gloveboxes.

A major trend in glovebox designing is the partnership with other industries to integrate both products. An example of two industries working together to provide the best quality system is the welding industry. Controlled atmospheres in weld chambers need an atmosphere free of oxygen and moisture that enable welding companies to produce products for medical implants, microelectronics, jet turbines and titanium castings. The welding glovebox is integrated with either TIG, vacuum or YAG-Laser welding systems. Weld chambers assist in avoiding the use of expensive manually operated shielding systems such as gas lenses, trailing shields and backing bars. All of which require highly experienced welders to adjust to the correct shielding conditions. The use of gloveboxes in welding applications also saves money on wasted gas that is historically being purged and released into the atmosphere.

Gloveboxes specifically designed for high intensity discharge lamp (HID) production lines offer the best in design capabilities. HID lamps are widely used in homes, automobiles and workplaces around the world. Features in the lamp sealing

glove box include an integrated clean jet system that offers an effective and safe way to remove silicon oxide dust from the glove box and the plasma jet burners that are highly suited for sealing of glass tubes within the ultra clean atmosphere of the glovebox. Certain lamp sealing glovebox manufacturers offer a fully automated pump-fill station to fill the lamp tubes with process gas at the customer specified pressure and seal them in the inert atmosphere. Gloveboxes are also designed for the production of lithium polymer batteries. Lithium is considered hazardous under normal atmosphere conditions so the production of lithium batteries requires careful handling procedures with a great deal of planning and technology going into the safe storage, shipping and disposal of the material. The picture below illustrates the different design changes a standard glovebox makes to meet the needs of a customer producing lithium batteries. Lithium production lines integrated with gloveboxes come standard with high powered gas purifiers to accommodate the volume of gas that needs to be maintained within the glove box. Newly designed gas purifiers allow for larger, cleaner and more efficient ways to reduce the amount oxygen and moisture contaminants from the atmosphere. In a glovebox, batteries can be produced without the risk of water contamination and, unlike

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cleanrooms, the moisture content in a glove box is uniform, controlled, measured and independent of the number of operators working in the production room.

Pharmaceutical gloveboxes (isolators) are specifically designed to meet the needs of their application. A large number of pharmaceutical isolators use laminar air flow technology in their design. This feature provides a system that directs the air flow for applications needing low particle counts while protecting the user from hazardous material being handled. The pharmaceutical industry utilizes isolators in the packaging of medicine, sterility testing, microbiological agents, potent compounds testing, liquid filling, sterile processing and powder processing. In addition, gloveboxes manufactured for pharmaceutical and nuclear markets have been designed to provide the barriers of protection needed in the handling of hazardous chemicals and/or radioactive material. Barrier isolators (glove boxes) used in the pharmaceutical industry are designed to handle hazardous pharmaceutical compounds, chemotherapy agents and IV mixtures that can be harmful to the end user. Barrier isolators are also designed for a wide range of applications crossing many different marketplaces. Smaller more compact designed stainless steel glove boxes are commonly found in mobile laboratories which respond and work in the detection and clean up of possible bio terrorism threats. Other glovebox designs, like the acrylic (plastic) single molded

glovebox can be used to support research laboratories added protection from fume hoods when working with sensitive material. Glovebox manufacturers can build containment systems, barrier isolators to support a wide range of designs to meet the needs of all applications.

Gloveboxes have been displayed on laboratory floors for over 60 years. Emerging technologies are expanding the design features of today's glove boxes along with providing a more efficient and productive system. New design capabilities provide the end user with a product that can be easily integrated while maintaining a controlled environment. Most glovebox manufactures have the ability to design and engineer gloveboxes for a variety of applications. System features like the touch screen PLC provides the next generation in user friendly software. The PLC controller can operate basic functions of the glovebox eliminating the possibility of human error. Gloveboxes designed with the new PLC controller can better track operational hours of the box and provide feedback to the end user about potential problems and when they occurred. Troubleshooting errors in the glovebox through the PLC controller can save the end user valuable time and money in their research and production. Glovebox manufacturers have also redesigned and upgraded analyzers, to monitor oxygen and moisture levels within the glovebox atmosphere. The analyzers which are calibrated using certified traceable gases, read real

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time measurements displayed on the PLC controller providing an easy, accurate and reliable reading. It is vital to maintain the atmosphere within the glovebox and manufacturers have designed features

like the new analyzer to improve the effectiveness of the system.

Glovebox design is continually improving to better meet the needs of the customer. The design of a glovebox plays an important role in producing a number of today's products while supporting the research and development for the products of the future. Gloveboxes support the manufacturing of lithium batteries, thin film batteries, photovoltaic cells and OLEDs which create products used in alternative energy vehicles, medical equipment, wireless communications, military applications and a broad range of other portable electronic devices. Metal halide lamps produced in gloveboxes are among the most energy efficient sources of white light available today and are commonly used in the lighting of athletic fields, commercial interiors and in the lighting of television sets. Gloveboxes are standard tools in the research and development of organic solar cells that are being researched and produced using gloveboxes for the production of alternative energy solutions. Gloveboxes enable the transfer of extremely clean wafers and provide a process that is both exceptional in efficiency and in material quality. The design of a glovebox is always growing and meeting the demands of the marketplace. The advantages over CleanRooms enables glove box manufacture the ability to supply a reliable product at an affordable price. Technological breakthroughs and customer demands will continue to shape the glovebox in the future. Glovebox manufacturers are continually evolving to meet the needs of tomorrows emerging technologies. ❖



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