

Aerogel Wall Manufacturer Key Technologies and Manufacturing Processes of Vacuum Insulation Panels (VIPs)



Xinxiang, Henan May 20, 2026 (IssueWire.com) - Through the structural analysis and thermal insulation mechanism of Vacuum Insulation Panels (VIPs), it can be concluded that the core technologies of VIPs lie in the core material and the barrier film material.

- Core Material Technology

The selection of core materials must meet multiple technical requirements. In addition to providing structural support, the material itself should possess a low thermal conductivity and effectively reduce radiant heat transfer inside the panel.

More importantly, materials used as VIP cores must feature an open-pore structure, allowing the internal gas to be evacuated efficiently during the vacuuming process. At the same time, the microporous structure should minimize contact points within the material to reduce solid heat conduction.

Currently, the most widely used core material for building insulation VIPs in Europe is fumed silica. This material satisfies nearly all of the above performance requirements, including excellent thermal insulation capability and stable vacuum performance. However, its main disadvantage is the relatively high production cost, which increases the overall manufacturing cost of VIPs.

- Barrier Film Technology

The selection of barrier film materials also requires comprehensive consideration of multiple factors.

First, the barrier layer must provide excellent thermal resistance. Second, it must offer both gas and moisture barrier performance as well as reliable sealing capability.

A typical high-barrier film specially designed for VIPs is composed of multiple high-barrier films, aluminum foil layers, and nano-polymer films. These materials are bonded together using low-viscosity, high-adhesion adhesives through a “dry lamination” process and high-temperature, high-frequency heat sealing. The total thickness is generally greater than 120 μm .

Key performance characteristics include:

- * Interlayer peel strength greater than 5 N
- * Heat sealing strength greater than 50 N
- * Excellent gas barrier performance
- * Superior moisture resistance
- * High puncture resistance
- * Easy heat sealing capability
- * Outstanding protective performance

- Vacuuming and Packaging Processes

After solving the two core technologies of core materials and barrier films, further research and

optimization can be carried out in areas such as:

- * Vacuum extraction technology
- * Encapsulation and sealing processes
- * Automated manufacturing techniques
- * Long-term thermal stability control

These technologies are essential for achieving large-scale and industrialized production of VIPs in practical engineering applications.

Conclusion

As one of the most advanced thermal insulation materials available today, Vacuum Insulation Panels combine ultra-low thermal conductivity with thin-profile design advantages. The continuous improvement of core material technology, barrier film technology, and vacuum packaging processes will further promote the application of VIPs in construction, refrigeration, cold-chain logistics, household appliances, and other energy-saving industries.

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