



# CDI’s Carbon Fiber Reinforced PEEK Material Selected for New Valve Design

## PROBLEM IDENTIFIED

**Application:** Multi-industry valve equipment built to serve the Oil & Gas, Petrochemical, Industrial, Chemical, and Pharmaceutical Markets

**Issue:** Manufacturer of High-Performance Valves was tasked to redesign an existing valve with an aggressive 1-year timeline

**Valve Duty:** Essential that valve delivered reliability, low maintenance, and suited a competitive cost environment

The instrumentation ball valve market is expected to reach USD 3.9 billion by 2025, at a CAGR of approximately 3% during the forecast period. Need for ball valve replacement, growth in energy consumption, increasing industrialization, and smart city initiatives across the globe are the key factors driving the market. The growing use of instrumentation valves in various end-user industries, including oil & gas, healthcare, and chemicals, is also fueling the growth of the valves market. The performance of these valves is critical in nature as they are tasked with providing the directional control of fluids consumed in process power and instrumentation function.

A leading manufacturer of high-performance valves sought to partner with CDI on an ambitious project to redesign one of their highest volume products, with a target goal of completion and commercialization within one year.

The manufacturer had firm requirements for the new equipment – reliability, low maintenance, all at a competitive cost. CDI’s rapid response, effective project management, testing, and precision manufacturing of quality components were key for success.

## TECHNICAL SOLUTION

The first step was to analyze the current production valve and find ways to increase efficiency, reduce cost, and maintain dependability. CDI determined that one of the big cost drivers was the machined PEEK valve seats, which could be replaced with an injection molded seat.

## CASE STUDY - NOVEMBER 2020

CDI's Engineering, Procurement and Material Development teams worked in tandem with the customer, discussing some of the possible roadblocks like knit line, gate, flatness and surface finish on the sealing face. A Finite Element Analysis (FEA) was conducted to give CDI's customer the confidence needed to proceed with this project on several smaller size valves. Several iterations of prototype samples were machined from melt-molded PEEK material which best supported the tight timeline. CDI's objective was to find the perfect balance of tensile strength, thermal stability, elongation, wear, coefficient of friction, and moldability.

CDI's material scientists and engineers collaborated to develop two material formulations of varying amounts of Carbon Fiber reinforced PEEK for injection molding. CDI's global supply chain was leveraged to provide these two PEEK compounds within 2 weeks. Ultimately, material and product testing determined the optimal formulation of the Carbon-Fiber-Reinforced PEEK for the most favorable mechanical properties in this application. CDI's PEEK compound (Carbon Fiber Reinforced) was chosen for final production parts. By streamlining the logistics and development process, and moving swiftly from consultation to testing, and then to material selection, CDI reduced the project timeline by 15%.

To maintain active communication and to mitigate issues, CDI conducted weekly conference calls with the customer on project updates, test results, and action items. Through a combination of pre-development engineer consultation, material development and testing, prototyping assessments, and expedited logistics and global supply chain support, CDI experts were able to help its customer benchmark operational performance, define key metrics, and implement a solution to achieve long-term operational goals to deploy and commercialize the customer's new valve.

## RESULTS

With lower cost molded parts and better performing seat material compared to unfilled PEEK, CDI's Carbon Fiber reinforced PEEK helped its partner meet the stringent time and equipment demands. The new design of the instrument ball valve delivered the quality end-users mandate. The new valve was rated from a broad temperature range and a high-pressure threshold. CDI's Carbon Fiber reinforced PEEK passed all the customer's product requirements, notably the cold and hot temperature thermal cycle testing without leakage, passed high pressure and chemical resistance tests.

With CDI's high-performance valve seat in place, the new valve met all the requirements of the manufacturer and exceeded the capabilities of similar valves from industry leading valve manufacturers. This partnership between CDI and the OEM helped to strengthen our technical collaboration and laid the groundwork for future opportunities and growth markets.

## FURTHER INFORMATION

To learn how CDI Energy Products can improve performance in your operations, please visit the website at: [cdiproducts.com](http://cdiproducts.com).

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The descriptions, design and performance information, and recommended uses for the products described herein are based generally on our design and manufacturing experience, product testing in specific conditions, and industry standards. The foregoing information is for general guidance only and does not constitute a guaranty or warranty of design or warranty of performance. Every effort has been made to ensure the information provided is accurate and up to date. However, the information provided herein is provided “as-is” and we make no representations or warranties of any kind, express or implied, with respect to the information provided. We reserve the right to make product changes from time to time, without prior notification, which may change some of the information provided herein. All warranties regarding the products described herein will be given in writing at the time of sale of such products. Each purchaser of such products must decide if the products are suitable to the intended use of such purchaser.

### **BETTER SCIENCE. BETTER SERVICE. BETTER SOLUTIONS.**

- **In pursuit of Better Science, CDI developed Carbon fiber reinforced PEEK material to product valve seats to meet a broad temperature range and a high-pressure threshold.**
- **In pursuit of Better Service, CDI leveraged its global supply chain and worked with its PEEK resin supplier to make two PEEK compounds within 2 weeks.**
- **In pursuit of Better Solutions, CDI conducted FEA testing and its engineering, procurement and material application teams worked in tandem with the customer, discussing some of the possible roadblocks like knit line, gate, flatness and surface finish on sealing face.**