



FLUOROCARBON

CASE STUDY

FLANGED SPRING-ENERGISED PTFE ROTARY SEAL FOR SEMICONDUCTOR LOAD CLEANER APPLICATION



OVERVIEW

A UK-based semiconductor manufacturer required a custom-engineered replacement for a flanged, spring-energised PTFE rotary seal used in a load cleaner application. The seal operated in continuous contact with deionised (DI) water and was subject to rotary motion within a contamination-controlled process environment. Non-standard dimensional requirements across bore, shaft, cross section, and flange geometry precluded the use of any catalogue solution.

TECHNICAL CHALLENGE

The original seal was manufactured from a carbon and graphite-filled PTFE compound. However, the specific grade could not be confirmed. The replacement had to satisfy three engineering criteria simultaneously:

1. Dimensional conformance: The seal geometry was defined across multiple tightly tolerance parameters, with sub-1 inch bore and shaft diameters and a compact cross section requiring custom manufacture to maintain full compatibility with the existing hardware assembly.
2. Chemical compatibility: DI water is highly leaching in nature, aggressively extracting ionic contaminants from materials it contacts. Carbon and graphite-filled PTFE compounds carry a measurable risk of ionic leaching into the DI water stream, which is a critical concern in semiconductor processing where ultrapure water integrity must be maintained throughout the process cycle.
3. Tribological performance: The rotary application required a seal material with low friction characteristics and sufficient wear resistance to maintain dimensional stability and sealing integrity over the component's service life.

OUR APPROACH

Fluorocarbon's engineering team started by building a thorough picture of the application: the motion type, process fluid, operating conditions, and the constraints imposed by the existing hardware. Only then did material selection begin.

With DI water as the process fluid and rotary wear as the key mechanical consideration, we evaluated alternatives to the original carbon and graphite-filled specification. Our recommendation: Fiberglass-filled PTFE, a material that combines excellent chemical resistance to DI water with the wear characteristics needed for sustained rotary duty.

Manufacturability to the specified non-standard geometry was confirmed, with tolerancing assessed to ensure fit and function within the existing assembly.

Production feasibility, including minimum order quantities and lead time, was evaluated in parallel to support commercial planning.

OUR ENGINEERED SOLUTION

Fluorocarbon developed a custom fiberglass-filled PTFE spring-energised rotary seal, manufactured to the client's full non-standard dimensional specification. The design delivered material compatibility with the DI water process environment, controlled tribological performance for rotary duty, and precise dimensional conformance for direct integration into the existing assembly without requiring hardware modification.

WHY FLUOROCARBON

Non-standard applications require more than off-the-shelf solutions; they demand a fully engineered approach. By combining deep materials expertise, detailed application analysis, and in-house manufacturing capabilities, Fluorocarbon delivers bespoke sealing solutions where standard products cannot perform.

The result is a tailored, reliable solution designed to meet the exact demands of your application.