R&D Action Framework for PFAS

Identification – How do we find potential PFAS occurrence?

Purpose: To map and identify PFAS occurrence effectively, practically, and economically.

The workflow follows an "inside-out" approach, where you start with your own data before moving to external sources and physical tests.

Map with Bill of Materials (BOM) & Material Database: This data foundation is key to screening components systematically, and it facilitates future regulatory reporting and access to new markets.
Use Material Specialist Expertise (Mapping Technical Properties) and review technical documentation: analyze Safety Data Sheets and technical data sheets for the components flagged as potential risks by your BOM screening based PFAS indicators such as low friction, wide temperature range, chemical resistance, water+oil+dirt repellency, high wear tolerance, electrical insulation capacity.
Supplier Dialogue & Supplementary Tests: Contact suppliers with targeted inquiries and statements for high-risk components, though be prepared for a low response rate initially. Supplement with physical chemical analyses. Start by testing Total Fluorine (TF) at the component level to get a quick and low-cost indication of fluorine levels. Note that TF also detects inorganic fluorine (false positives), so additional information/testing is needed.
Mapping the Machinery (Risk of Leaching): Inspect the production equipment itself for potential PFAS in gaskets, lubricants, high-temperature components etc. Some industries have standards for similar procedures, such as USP 665 and ISO 10993-1.

Problem Formulation – How do we approach the R&D challenge?

Purpose: To translate "removing PFAS" into concrete and action-oriented development requirements.

Once potential PFAS sources are identified and no solutions can be found “on the shelf”, the R&D challenge must be strategically defined and scoped.

Strategic Focus (Where do we make the biggest difference?): Start with the most critical materials. Use the gathered knowledge to prioritize which components to investigate

first. Start with the "low-hanging fruit" (the easiest and most obvious parts) to build internal experience. Prioritization should align with the company's overreaching goals, whether defined by *strategy*, *revenue*, *volume*, branding value, or *high-value products*.
Grouping Materials (System Theory): Divide the product's materials and components into logical groups. Instead of viewing a component only as an isolated part, view the product as a coherent system of interdependent parts. If you change one material (e.g., a seal), it can affect how the entire system (e.g., fluid flow, pressure, and wear on surrounding parts) functions.
Substitution vs. Redesign: Identify whether the phase-out can be handled by a pure material substitution or if it requires an actual redesign of the product. *Remember:* A direct 1:1 replacement is usually impossible. Therefore, investigate whether the current material requirements can be updated/relaxed, or if the product's current design is "locked".

The R&D Process – How do we drive the work?

Purpose: To navigate the special circumstances that characterize PFAS substitution.

PFAS projects differ from ordinary R&D. The process must be adapted accordingly.

Understand the Special R&D Conditions for PFAS: The challenge is massive because it covers an entire group of materials and affects the entire value chain. Since PFAS substances often solve many technical requirements at once with extremely high performance, a broad **system solution** (top-down) is almost always required rather than a simple, isolated material solution (bottom-up).
PFAS must be addressed in both the finished products and in the production process itself.
Breaking Down Complexity (Practical Execution): *Create internal awareness:* Make PFAS and other substances of concern an agenda for the entire organization. *Establish a data foundation:* Start by building your database of materials. *Take it step-by-step:* Start with the easiest substitution, build success and experience, and then take on the next one. *Set boundaries:* Take an early, strategic decision on when the development work is considered complete and when to stop the process.
Qualification and Testing: Once initial screenings are completed, the actual qualification work with physical tests, models, and simulations follows the same well-known principles that apply to all other R&D projects in your company.

Implementation – How do we ensure quality and compliance in the long run?

Purpose: To maintain quality and handle market demands once a solution is found.

Once the PFAS-free alternative is developed, it must be secured against future risks and marketed correctly.

Establish a Testing Plan: Develop an established, ongoing quality check in collaboration with *e.g.* suppliers to ensure that new product batches do not inadvertently contain PFAS.
Certification: Investigate and obtain relevant certifications for the new materials *e.g.* UL Solution 746G for plastics to document product reliability for customers.
Critical Handling of the Term "PFAS-free": Take a critical approach to how you market your products. Several sectors increasingly demand "PFAS-free" products, but often without knowing the technical definitions and testing challenges behind it. Remember due to unavoidable background contamination in the environment and the detection limits of testing methods, consider using more precise phrasing such as **"no intentionally added PFAS"** or **"non-PFAS product according to standard XYZ"** instead of the absolute term "PFAS-free". To build trust and back up these claims credibly, leverage recognized third-party certifications.