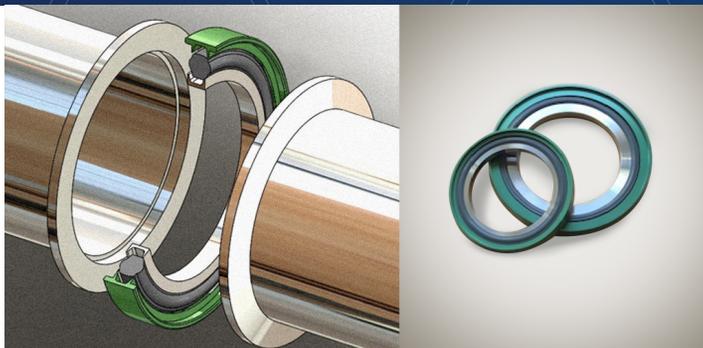


Emerging SubFab Challenges:

WHAT YOU NEED TO KNOW



Increasingly complex chemistries in semiconductor processes require higher operating temperatures and more robust seals in the SubFab.



The SubFab is critical to maintaining the operational effectiveness of the cleanroom environment above it. As wafers undergo a variety of processes including etch and deposition, effluent gases like flammables, oxidizers, and corrosives are shuttled through exhaust lines into the SubFab for safe disposal.

Gases flowing into the SubFab condense within the exhaust lines, which can deposit particles and lead to premature equipment failure. Thermal management systems are utilized to increase temperatures within the exhaust lines to keep gas molecules moving. The migration towards higher temperatures to avoid condensate heightens the need for reliable equipment, including pumps, abatement units, and valves.

Seal material selection considerations include temperature and chemical resistance to highly reactive gases and radical species. Selecting or installing the wrong material into a SubFab application could compromise the integrity of the seal and possibly lead to an unplanned maintenance event that could impact production in the cleanroom above.

Within the SubFab, elastomers are often chosen as the seal material. Elastomeric seals are flexible, durable, easy to install, and conform well against many different surfaces. Fluoroelastomers, including FKMs and FFKMs, are often selected as sealing materials for the SubFab.

General purpose FKMs feature good chemical compatibility and high temperature capabilities. With technological innovation, Fab conditions are becoming more aggressive and pushing the limits of general purpose FKMs in the SubFab. Greene Tweed's high-performance Fusion® F10 is a highly fluorinated elastomer material designed specifically for the Semiconductor industry that extends the capability where other FKMs begin to breakdown.

Emerging, reactive chemistries, such as those found in ALD and epi SiGe processes, have a higher probability of condensation and require thermal management systems that increase temperatures in the forelines and exhaust lines to keep gases from depositing particles on equipment. As temperatures within these lines rise, many leading device manufacturers have switched to FFKMs, such as Chemraz® SFX, to ensure safety and tool uptime.

As Chemraz® SFX boasts higher operating temperatures up to 300°C/572°F and broader chemical resistance than FKMs, adoption of Chemraz® SFX helps ensure forward compatibility. Documented field experience has demonstrated chemical resistance to an array of SubFab effluents in these temperature ranges, and internal Greene Tweed analysis has shown that SFX offers extra protection from in-line chemical interaction by limiting inclusion of moisture and oxygen.

Ensuring the right o-ring is properly installed into the KF fitting assembly minimizes the chance of a premature failure. Unlike other commonly used materials in the SubFab which are typically black in color, Chemraz® SFX is grey and F10 is cream, making them easier to distinguish from other materials and lessening the chance that the wrong material is installed.

Furthermore, Chemraz® SFX's performance advantage in harsh conditions relies on its innovative seal design. Greene Tweed's custom engineered assembly overcomes the mechanical limitations of KF fittings in extreme process environments and improves seal performance. The custom assembly is available in different materials including stainless steel, aluminum and PTFE. Chemraz® SFX solutions are offered in a green-colored assembly as an additional safeguard to ensure the proper material and seal is being used.

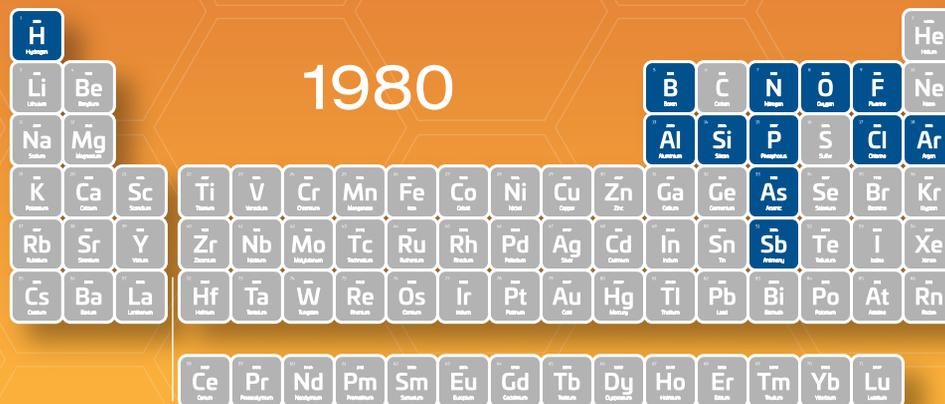
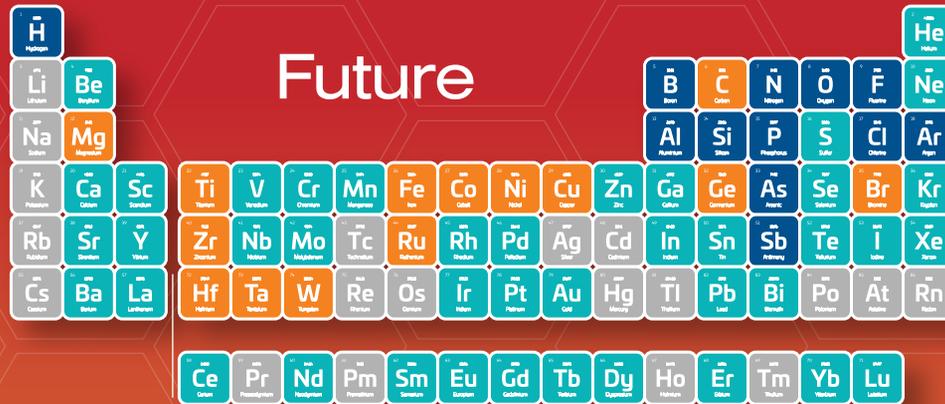
Backed by a broad portfolio of elastomeric materials, including general purpose and high-performance compounds, and expertise in the semiconductor industry, Greene Tweed engineers evaluate each application carefully and recommend the material best suited to it, thus ensuring superior cost of ownership.

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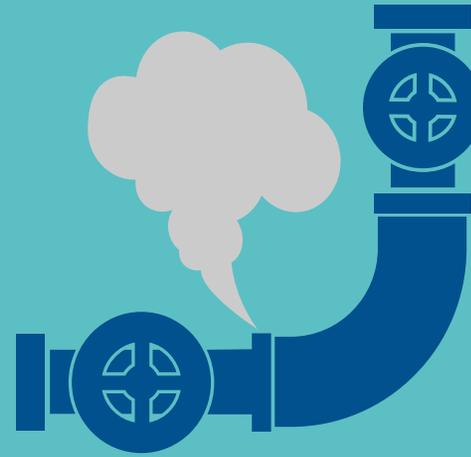
Chemistries
& temperatures
are changing;
are your
seals ready?

COLOR KEY

- Elements used in future materials research
- Elements used in commercial CMOS devices
- Traditional elements used in Si CMOS manufacturing



WHY DOES IT MATTER?



SAFETY RISKS

Failed seals lead to toxic gas releases, exposing people and the environment

OPERATIONAL INEFFICIENCY

Unplanned maintenance robs organization of optimal resource

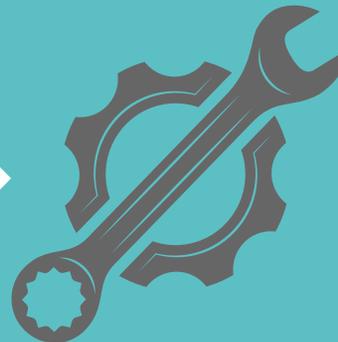
Clogged Foreline /Exhaust Line

Shutdown SubFab Vacuum System

Tool Down

Time Spent to Bring Tool Back to Production

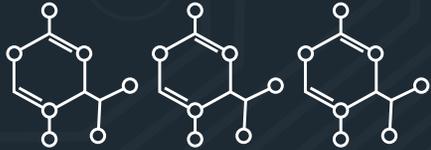
Loss of Wafer Output



GREENE TWEED HAS YOU COVERED

CHEMICAL/HIGH TEMPERATURE RESISTANCE

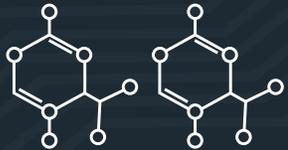
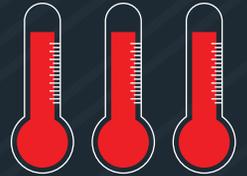
DESIGN CUSTOMIZATION FOR PERFORMANCE



**CHEMRAZ® SFX
(FFKM)**

**Extreme
Use Seals**

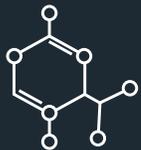
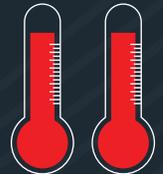
**CUSTOM ASSEMBLY
COLOR CODED MATERIAL
COLORIZED OUTER RING**



FUSION® F10 (FKM)

Performance Use Seals

OPTIMIZED O-RING



NBR, EPDM, FVMQ

General Use Seals



Please contact Greene Tweed to understand if a Chemraz® SFX or Fusion® F10 sealing solution will meet your SubFab needs.

gtweed.com