

An aerial photograph of a city, likely Copenhagen, showing a mix of modern glass-fronted buildings and older, traditional European architecture. The city is surrounded by green spaces and trees. The image is slightly faded to serve as a background for the text.

PFAS Restriction under REACH: ***What Way Forward for Fluoropolymers & F-Gases?***

Purpose of the Meeting

1. **Introduction**
2. **Annex XV:** share our observations
3. **Economic impacts:** share our assessment in case of a ban of Fluoropolymers & F-Gases altogether on the key sector of the economy
4. **Discuss possible way forward**

Approach of the Five Countries- some concerns

“Universal Ban”

- Annex XVII restriction to apply to all PFAS (fulfilling OECD definition),
- 18 months of ‘transition period’ after Entry into Force (EiF).

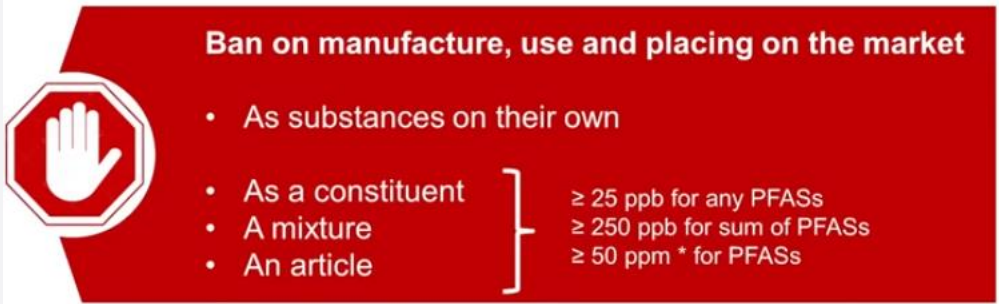
Derogations

- pesticidal active substances
- biocidal active substance
- human and veterinary medicinal products

Time-limited derogations = “delayed ban”

- applied either 6.5 or 13.5 years later from EiF
- tentative derogations proposed in square brackets [...] where data is not enough

Dominating “anti-PFAS” narrative is based on old technologies based PFOS, PFOA – banned since more than 10 years in Europe



Ban on manufacture, use and placing on the market

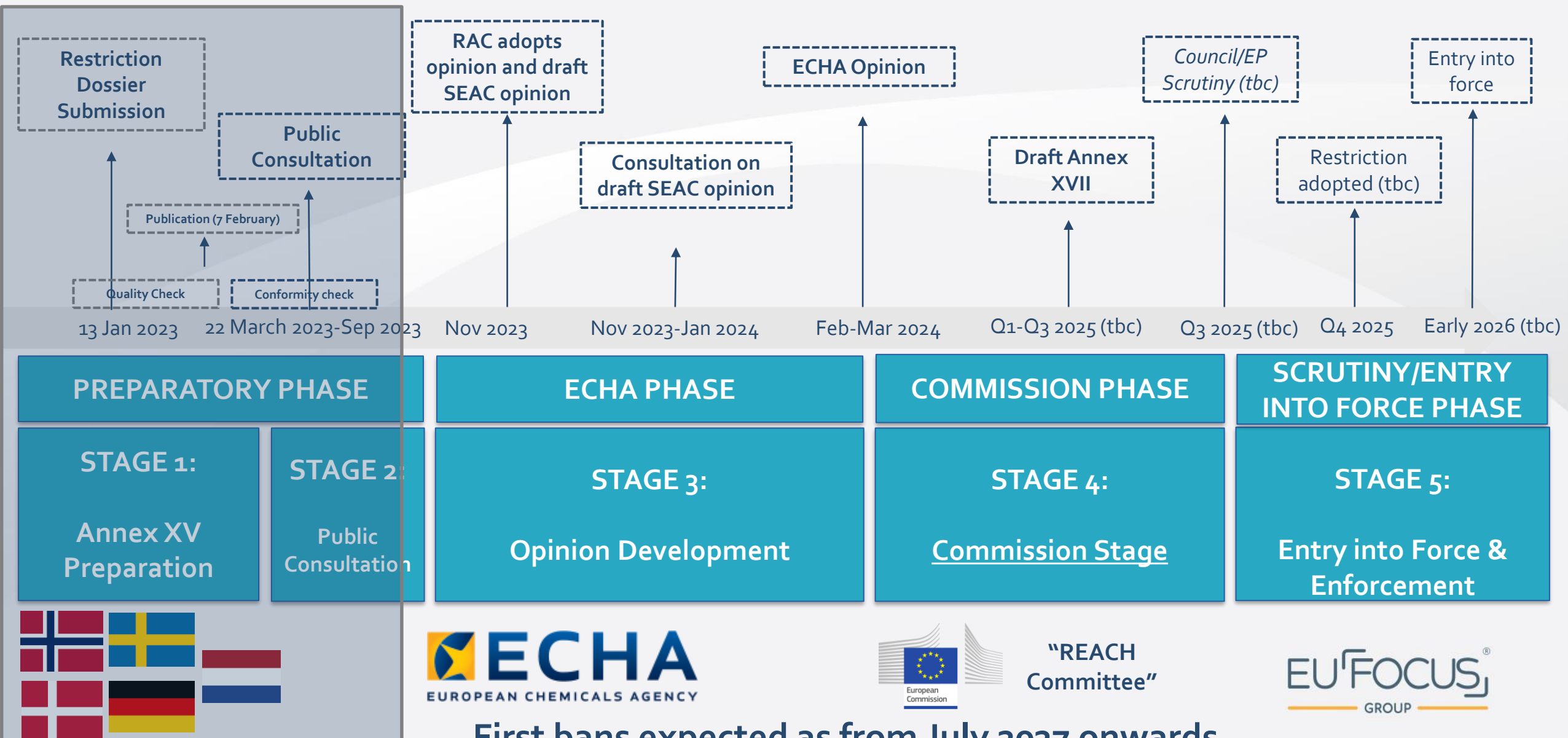
- As substances on their own
- As a constituent
- A mixture
- An article

≥ 25 ppb for any PFASs
≥ 250 ppb for sum of PFASs
≥ 50 ppm * for PFASs

* If total fluorine exceeds 50 mg F/kg the manufacturer, importer or downstream user shall upon request provide to the enforcement authorities a proof for the fluorine measured as content of either PFASs or non-PFASs.

PFAS Restriction Timeline (2023-2026)

TODAY



First bans expected as from July 2027 onwards

Some Substances in scope of PFAS Proposal

Fluoropolymers (PTFE, PFA, etc)

- Fluoropolymers are a specialty plastic
- Durable by design
- Fluoropolymers have thermal, chemical, photochemical, hydrolytic, oxidative, and biological stability and they have negligible residual monomer and oligomer content and low to no leachables.
- Fluoropolymers do not pose a significant risk to human health or the environment when used for their intended purposes.

F-Gases (e.g 1234yf and 1336mzz isomers)

- F-Gases are specialty performance refrigerants and fluids.
- F-Gases (1234yf) are circular by design
- Three main properties: cooling, heating and insulation (blowing agents).
- Ultra-low global warming potential (GWP) and no Ozone depleting potential (ODP)

REACH PFAS Annex XV – Our Concerns

THE PROPOSAL BY 5 COUNTRIES IS FLAWED

- *No derogations, only bans (+18 months after EiF) or “delayed bans” (+6.5 or +13.5 years after EiF)*
- Persistency – main criterion for ban (“P-sufficient approach”):
 - No hazard assessment
 - No information on use resulting in emissions
 - Nor risk assessment
 - Insufficient analysis of alternatives
 - No causal link between alleged presence of PFAS and actual fluoropolymers usage
- Wrong premises (e.g. non-fluorinated polymerization aids are ‘better’ for the environment)
- Old data (e.g. HFPO-DA emissions data from 2013)
- Alternative RMOs not considered

OVERALL: no demonstration of unacceptable risk & no recognition that fluoropolymers can be produced responsibly

DIRECT IMPACT ON FLUOROPOLYMERS and F-Gases

1. **All PFAS as per definition**, unless explicitly derogated, will be **banned as from July 2027**
2. **Most substances will be completely banned** after a transition period (if at all)
3. **Fluoropolymers and F-Gases** are in scope of restriction proposal.
4. **Fluorinated Polymerization aids** are **banned** for the production of PTFE and FKM (Chemours products).
5. **Transported isolated intermediates** used under strictly controlled conditions are **banned** (contrary to REACH).

OVERALL: indirect ban on high-tech economic sectors, including green technologies, relying on fluoropolymers.

FLUOROPOLYMERS: can be manufactured responsibly

HFPO-DA=GenX polymerization aid

Note: By the end of September Chemours is publishing a significant update

About HFPO-DA (GenX technology)

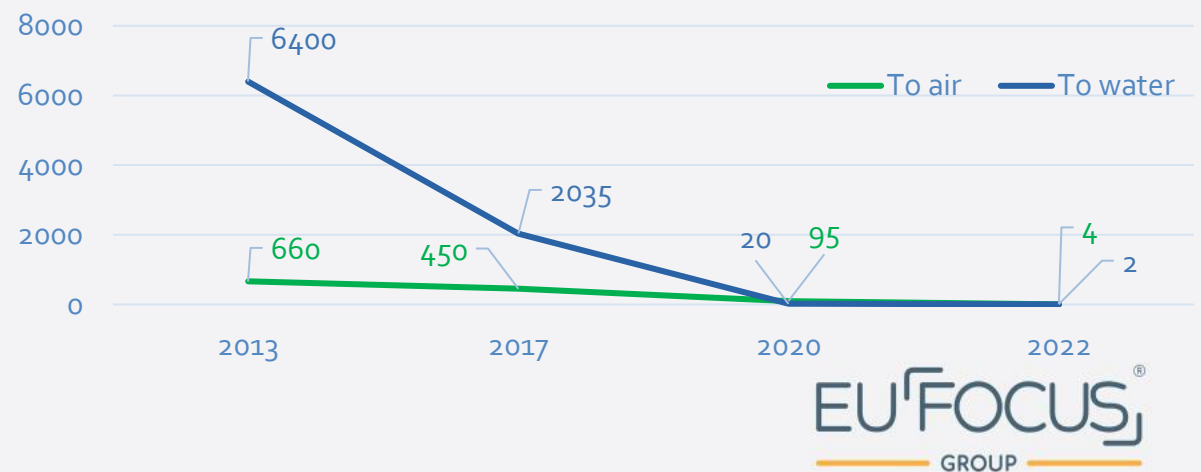
- ✓ HFPO-DA has been developed as a safer alternative to other polymerization aids
- ✓ HFPO-DA is not consumed during the polymerisation process and is recovered, re-used and recycled
- ✓ Polymerization aids only facilitate chemical processes and are not intended to be part of the final product
- ✓ For technical reasons, some direct or diffuse emissions of processing aids into the environment (air and water), cannot be excluded. The risks of direct and indirect emissions can be reduced through various filtering and chemical processing techniques, which have largely improved over the recent decades.
- ✓ HFPO-DA has some persistent and mobile properties but does not bioaccumulate in human tissues and is not classified for human health toxicity (non T) in the EU

HFPO-DA is only used in an industrial setting under permit conditions requiring the application of best available techniques and minimization of emissions. No health risks are expected for the local population

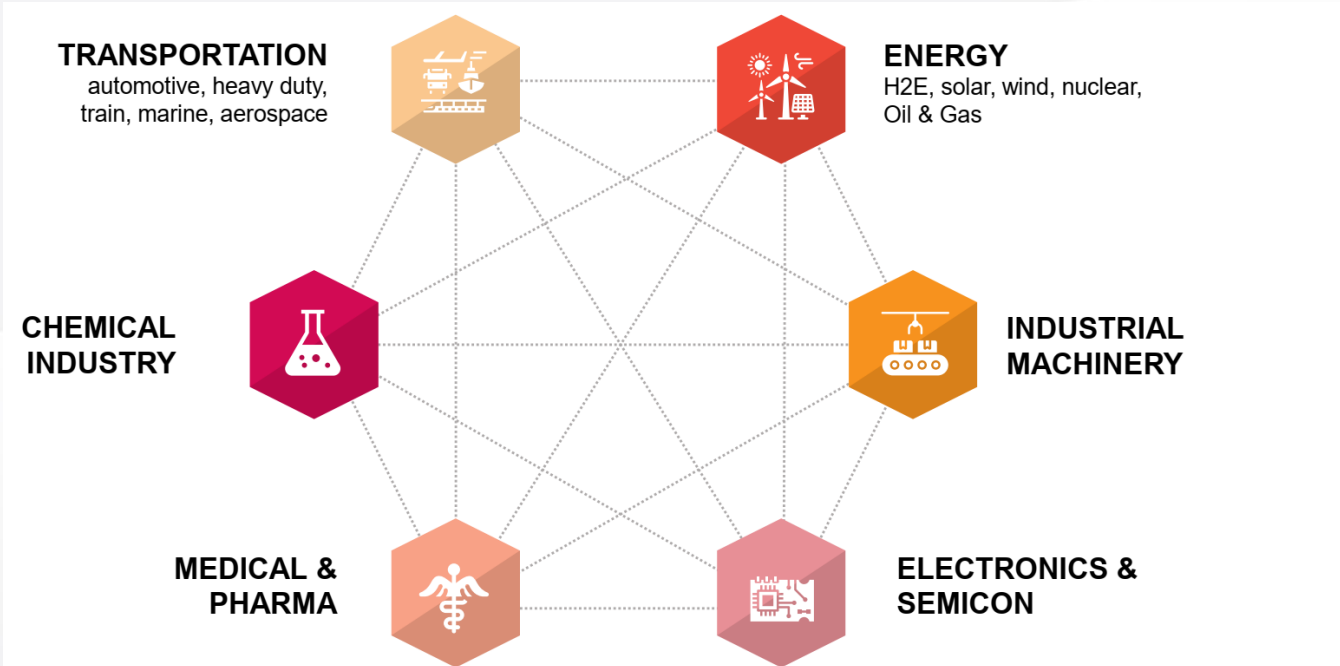
Responsible Manufacturing in the EU

- ✓ The Dutch National Institute for Public Health and Environment concluded that there is *"no health risk is expected for people living in the vicinity of the Chemours Dordrecht plant due to exposure"*
- ✓ Erik Haverkort – Dutch MP (VVD): *"Chemours can be seen as a cleaning company, as the water taken from the river has more PFAS than the water Chemours is emitting at the end"*, during a webinar on PFAS on April 6, 2023.
- ✓ These achievements are also reflected by the updated national permits, which are mostly at the limits of what is technically feasible:

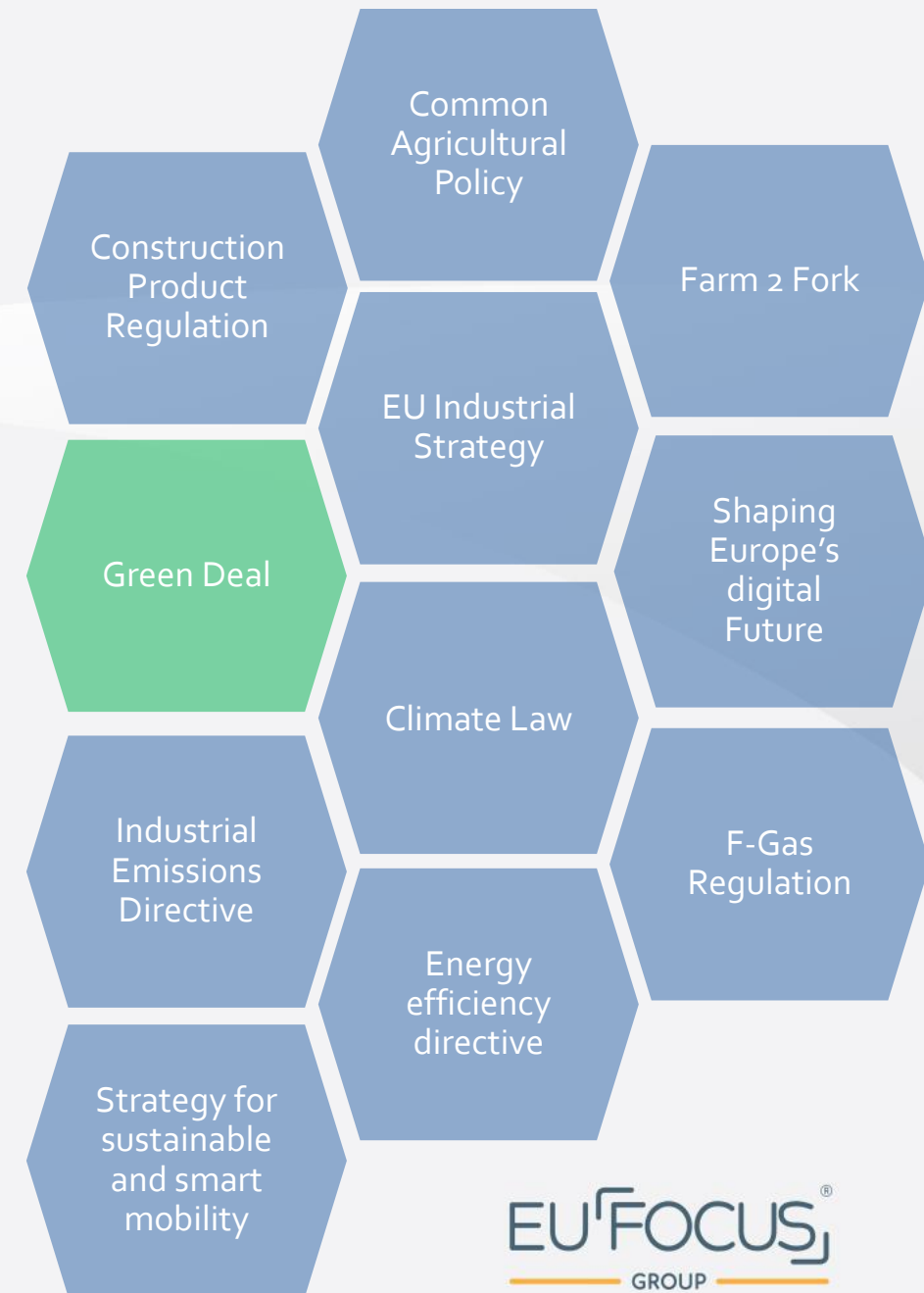
Dordrecht (NL) permitted HFPO- DA emissions to air and water (kg/ year)



Fluoropolymers and F-Gases are used across sectors and are key to EU Initiatives and Policies



- ✓ **All sectors are connected**, one sector cannot exist without the other
- ✓ Both FPs & F-Gases are **key driver of the "Green Deal"** (Upstream and Downstream)
- ✓ Both FPs & F-Gases are **substances of necessity** rather than choice



Applications in semiconductor manufacturing

PFA, PTFE, FKM, FFKM, AF, PFPE, HFCs, HFOs

SEMICON TOOLS

- Valves, Fittings, Tubings
- Pumps, Filters
- Lubricants
- Valve seats
- Valve sealing
- Vacuum pump oil
- Etchant gas
- Pellicle mask
- Flow measurement
- Thermal management
- Heat transfer fluids

PFA, PTFE, FEP, PVDF, FKM, FFKM, HFOs

CHEMICAL DISTRIBUTION SYSTEM

- Valves
- Fittings
- Heat exchanger/insulation
- Flow measurement
- Tubing chemicals primary
- Tubing chemicals secondary containment
- Water system tubing
- Pumps
- Filters
- Seals
- Electronic cleaners



FEP, ETFE, HFCs, HFOs

INFRASTRUCTURE

- Duct coating
- Air conditioning
- Humidity control
- Fire protection

PFA, FKM

WAFER TRANSPORT

- Wafer carrier
- FOUP sealing

PTFE, PFA

CHEMICAL PACKAGING

- Container lining
- Drums
- Tanks lining

Applications in Data Centers

Electrical/Electronic Systems

- Tapes, wires and cables
- Data cables
- Electrical connectors, insulators
- Sensors
- Displays, touch screens
- Anti-drip, easy clean, non-adhesive additives for computers and other electronic devices
- Printed Circuit Boards

PFA, PTFE, FEP

HFCs, HFOs

Air Conditioning & Cooling

- Temperature and humidity control
- Air-cooled cabinets and direct expansion systems

Maintenance

- Fiber optic end-face cleaners
- Defluxing and degreasing of servers or server components
- Fire protection of data centers

HFCs, HFOs

PFA, PTFE, FEP, HFOs

Equipment & Racks

- Immersion cooling fluid
- Wire and cable
- Gaskets and seals

HFCs, HFOs, FEP

Construction

- Building Foam Insulation - SPF
- Unitary HVAC Equipment Foam Insulation
- Data Cables

Applications in Medical

Medical devices and applications

- Surgically implantable medical devices such as vascular grafts
- Surgical mesh
- Heart patches
- Catheters
- Carrier fluid for the deposition of lubricants on medical devices and catheters
- Dielectric insulators in defibrillators, pacemakers
- Diaphragm pumps
- Membranes for filtering and venting purposes
- Sterile container filters, needle retrieval systems, Tracheostomy, catheter guide wire for laparoscopy, valves, fittings, pumps, tubing and medicine inhaler canister coatings
- Labware
- Medicine Packaging
- Items that need sterilization
- Metered Dose Inhalers

PTFE, FEP, PFA, ETFE, HFCs



Infrastructure

HFOs, HFCs

- Transport and stationary refrigeration systems
- AC, heat pump, & humidity control for:
 - Patient rooms
 - Special areas (OR, ICU, etc.)
- Thermal management for labs and equipment
- Refrigeration and insulation for Food Services and distribution of vaccines and pharmaceuticals
- Cleaning of supplemental oxygen systems for breathing air
- Foam insulation for cryogenic tanks
- Thermodynamic sanitary hot water tanks
- Fire protection



PTFE, FEP, PFA, FKM, PFPE, HFOs

Medical imaging & analysis

- Semiconductor chips
- O-rings, gaskets, seals
- Coating for wire & cable
- Tapes, wires, and cables
- Bearings and assemblies
- Degreasing

Applications in Clean Energy

Renewable Energy Production

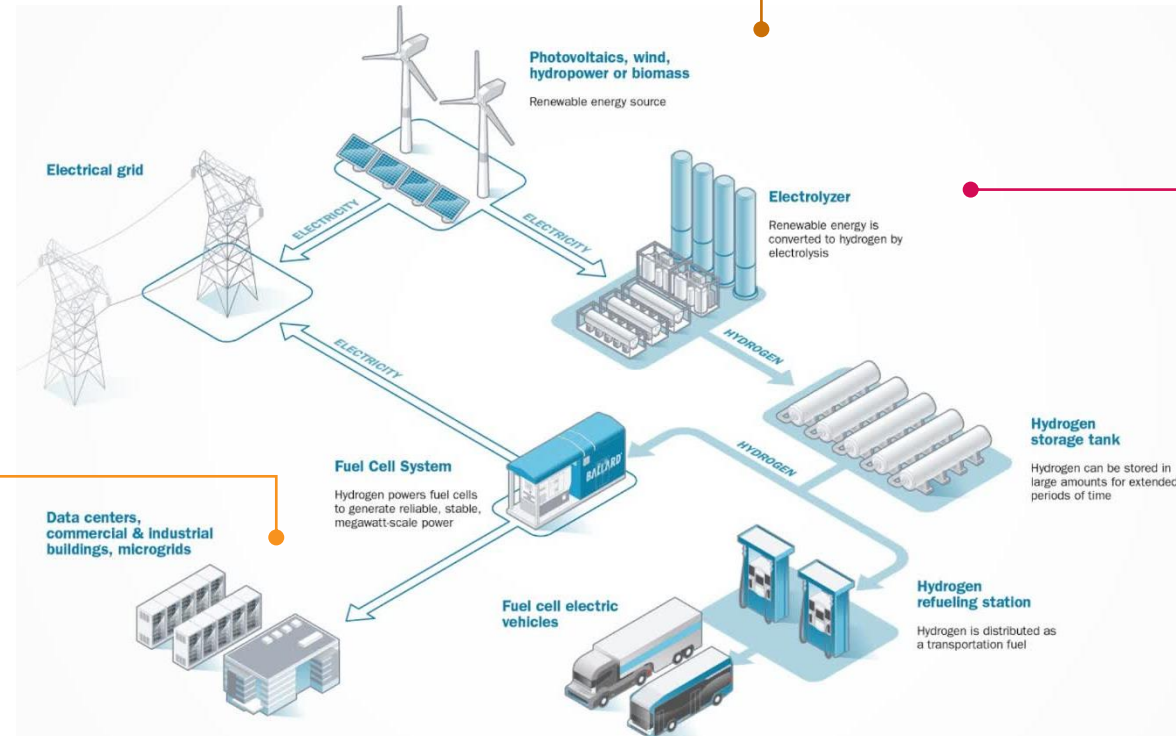
PTFE, FEP, ETFE, PFSA, FKM, PFPE

- Photovoltaic front sheets protection
- Photovoltaic back sheets insulation
- Junction boxes in photovoltaic vents
- Control centers for offshore wind parks
- Wind turbine paints and coatings
- Release film: support production of composite turbine blades esp. for offshore turbine PTFE bearings

Stationary & Mobility Fuel Cells

PFSA, FKM, PTFE

- Ionomer exchange membranes for PEM fuel cells
- Gaskets and seals to prevent leaks and environmental releases to reduce carbon dioxide emissions into the atmosphere
- Binder materials in the electrodes
- Component of the gas diffusion layers (GDLs)



Energy Storage

PFSA, FKM, PTFE

- Ionomer exchange membranes for flow batteries
- Gaskets and seals to prevent leaks and environmental releases to reduce carbon dioxide emissions into the atmosphere
- Binder materials in the electrodes

Hydrogen Production

PFSA, FKM, PTFE

- Ionomer exchange membranes for PEM water electrolyzers
- Tubing fluid transfer in alkaline water electrolysis hydrogen production systems
- Binder materials in the electrodes
- Gaskets and seals to prevent leaks and environmental releases to reduce carbon dioxide emissions into the atmosphere

Applications in Chemical Production

1/2

Manufacturing and processing

- Valves
- Vessels
- Reactor vessel and agitator lining
- Lined pipes and fittings
- Heat tracing
- Seals
- Gaskets
- Pumps
- Ion Exchange membranes
- Instrumentation lining
- Filters
- Refrigeration machines coolant
- Bolts/washers
- Data Wiring
- Distillation column packaging
- Lubricants

PTFE, FEP, PFA, ETFE, FKM, PFPE, PFSA, FFKM

HFCs, HFOs

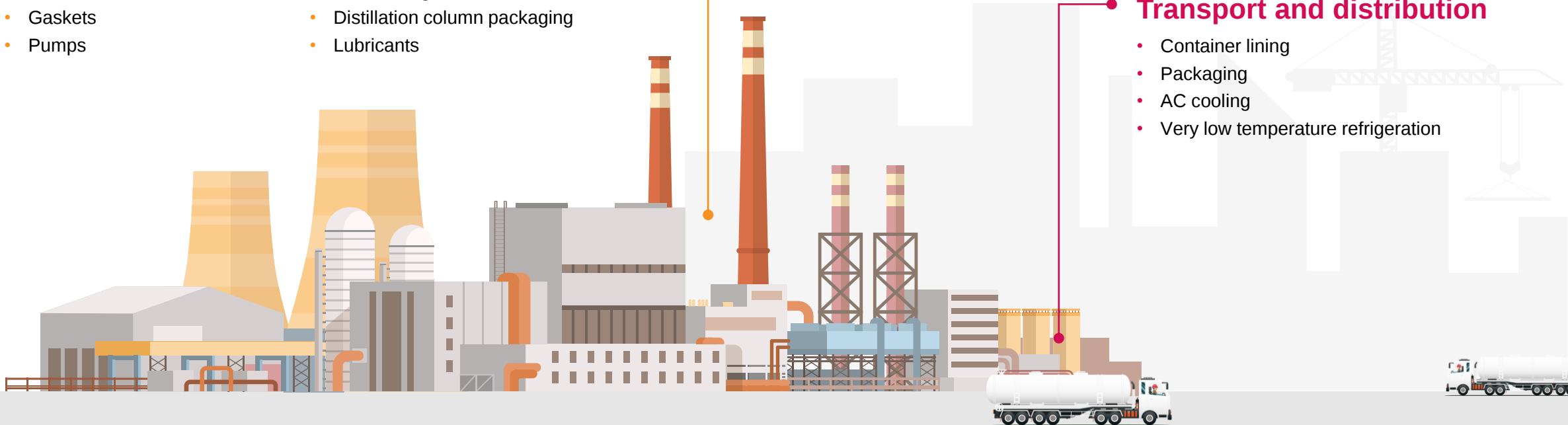
Technical equipment

- Propellants in degreasers, leak detectors, sealants, paints, drain openers

HFCs, HFOs, PTFE, FEP, PFA

Transport and distribution

- Container lining
- Packaging
- AC cooling
- Very low temperature refrigeration



ELECTRICAL SYSTEMS, WIRES, CABLES, AND SEMICONDUCTORS

- Semiconductor chips
- Lambda/O2 sensor conduit & grommet
- Electric mirror lubrication
- DC motor bearing lubrication
- Oxygen/NOx Sensor
- Heated seat wire
- Diesel pump wire
- ABS transmission brake sensor wire

- High tension ignition cable
- Battery terminal wire
- Convoluted wire harness conduit
- Cable tie wraps
- Xenon/bi-xenon headlight wire
- Throttle body injection wire
- ABS sensor cables
- Printed Circuit Boards

PTFE, FEP, PFPE, PFA, FKM

TRANSMISSION & TRANSAXLES

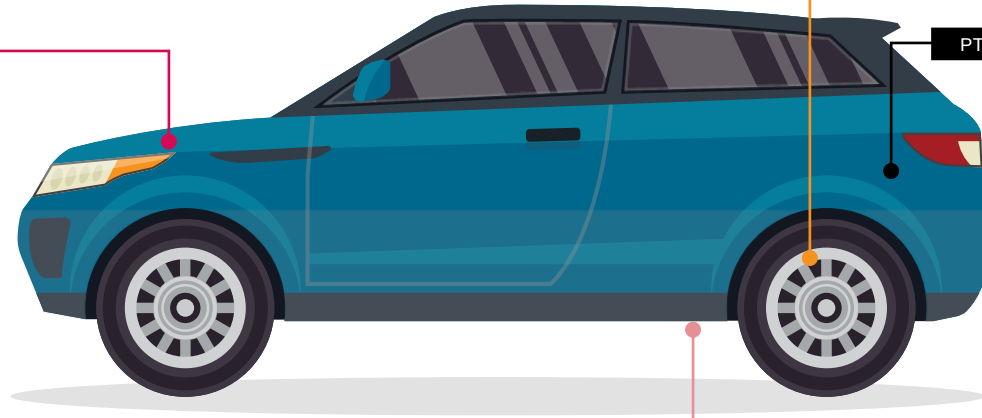
PTFE, FKM, PFPE

- Internal shift seal ring/clutch piston ring
- Clutch pilot and release bearings
- Clutch bearing lip seals
- Dual mass flywheel replacement
- Auto ORC de-coupler for alternators
- Driveshaft: CV joint lubrication

ENGINE & POWERTRAIN

PTFE, FKM, PFPE

- Head cylinder & oil pan gasket
- Transmission & crankshaft seals
- Valve stem seals
- Bearing lubrication
- Flexible O-ring & piston skirt coating
- Front engine accessory drive
- Throttle body bearings & lubrication
- ETC lubrication
- Actuator assembly; valve belt tensioner
- Air intake manifold gaskets
- Turbocharger hoses
- EV binder for battery and seals



PTFE, FEP, ETFE, FKM

FUEL SYSTEMS

- Fuel line: feed return, vapor
- Fuel line quick connector seals
- Interconnect hoses
- Filler neck hose
- Fuel rail crossover
- FIORS
- Fuel sender seal
- Connector o-rings
- Diaphragm pressure regulator
- Anti-expulsion tank valve
- Pressure injection bushing
- EV battery cooling

CHASSIS

PTFE, PFA, PFPE, FKM, HFCs, HFO

- ABS interconnected hose
- Hydraulic break lines
- Impulse hose at wheel
- Brake pad clips, shim and wear indicator
- Insulating foams and sound dampening
- Shock struts/absorber piston seals
- Dry Lubricant bearing door hinges
- Axle seals
- Adhesives
- NVH busing – lubrication
- Steering ball bushing incl. lubrication
- Steering ball joint insert and shaft steering splines
- Steering assist pump piston rings
- Cabin comfort and heating

Applications in the Cold Chain

Foam

HFCs, HFOs

- Insulated Transportation Shipping Containers / Railcar / Trailers - SPF Insulation
- Walk-in Cooler Panels
- Reach-in Coolers
- High-End Residential Refrigerators
- High-End Commercial Refrigerators
- Refrigerated Warehouse – SPF Insulation
- Spa foam Insulation
- Water heater foam insulation
- Lining of valves, piping, tubing, filters, seals, gaskets and other standard fluid handling components
- Lining of mixing vessels and tanks
- Coating on processing belts

Air Conditioning & Refrigeration

HFCs, HFOs

- Refrigeration for food preservation (farm)
- Industrial Ice Making (fishing vessels)
- Refrigerated transport (truck/trailer)
- Refrigerated transport (container – rail – ship)
- Refrigeration for food processing (flash freezing, etc.) (Industry graphic bullet points excel)
- Refrigerated Storage (warehouse) (Industry graphic)
- Refrigeration at point of sale (grocery, C-store) (Industry graphic bullet points excel)
- Refrigeration for food/beverage retail (restaurant, bar) (Industry graphic bullet points excel)
- Commercial Ice Making (Industry graphic bullet points excel)
- Refrigeration – home appliances (Industry graphic bullet points excel)



AIRFRAME

PTFE, ETFE, FEP, FKM, HFCs, HFOs

- Exterior surface coatings
- Toilet area galleys
- Overhead lockers
- Satellite dishes
- Aircraft wings covers
- Heat shrinkable protective covers
- Air bearings
- Electronic device trays
- Control surfaces
- Integral skin foams
- Paint Replacement Film
- 3D printed and molded parts for repair
- Packaging
- Sleeve items that require light transmission
- Fasteners
- Fire prevention systems

PTFE, ETFE, FEP, FKM, HFCs, HFOs

FUEL SYSTEMS

- Fuel lines and hoses
- Hydraulic systems
- Coating for wire & cable
- Tapes, wires, and cables
- Containment bags, bladders, and tanks
- Tank fuel seals and insulations
- Tank liners
- Tubing liners
- Fluid transfer devices

ENGINE & SYSTEMS

PTFE, FKM, PFPE, PVDF, HFCs, HFOs

- O-rings, gaskets, seals
- Satellite propulsion systems
- Throttle box seals
- Arming components
- Engine and exhaust components
- Battery binders
- Battery separators
- Gears, and slides
- Oxygen systems (propulsion, SCBA)
- Degreasing components and landing gear
- Cabin comfort cooling and heating

PTFE, FEP, ETFE, FKM, HFCs, HFOs

ELECTRICAL/ELECTRONIC SYSTEMS

- Tapes, wires, and cables
- Printed circuit boards
- Coating for wire & cable
- Electrical connectors, insulators
- Flight control systems
- Sensors
- O-rings, gaskets, seals
- Air bearings
- Electric harness parts
- Gears, and slides

Applications for Fluoropolymers & F-gases in Defense

Machinery

PFPE, PTFE, FEP, PFA, ETFE, HFCs, HFOs

- See trucks and planes
- Battery binders
- Pneumatic cylinders
- Aircraft fuel pump systems
- Hydraulic systems
- Fuel tank insulations
- Integral skin foam seating to increase protection
- Degreasing of engine components and landing gear
- Medium and heavy-duty vehicle AC
- Carrier fluid and lubricant deposition
- Lubricants

PTFE, HFCs, HFOs

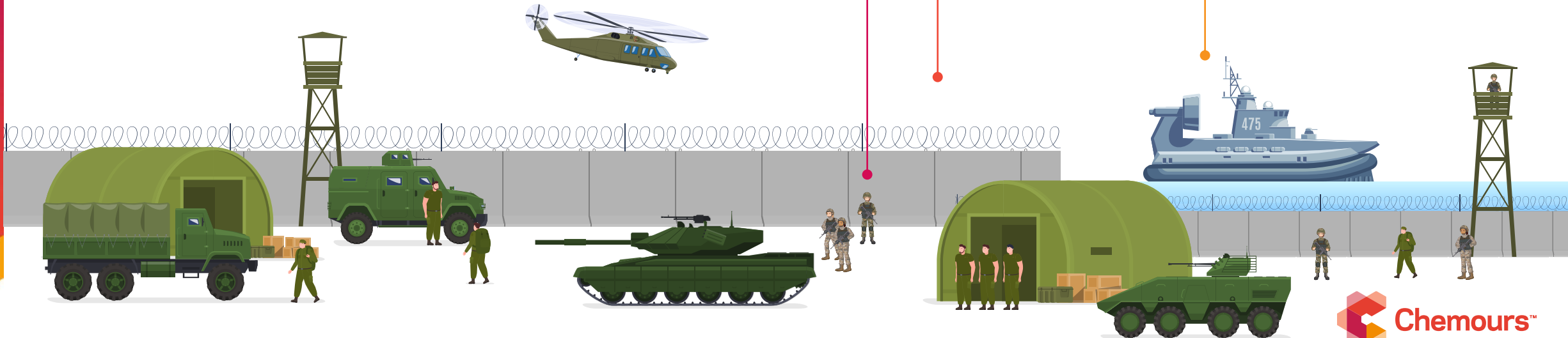
Soldier

- Protective garment
- Fireproof batteries

PTFE, PFA, ETFE, FEP, HFCs, HFOs

IT & Electronics

- All communication devices, transportation and command centers
 - High Frequency Circuit boards
 - Radar Radome
 - Data Cabling
 - High performing batteries



Way Forward - Fluoropolymers

Fluoropolymers should get “no time-limited derogation” for manufacturing and use in applications in transportation, medical, electronics, semicon, hydrogen, communication, chemical and other industrial and professional applications

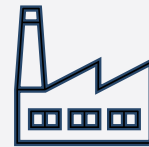
- **Condition:** responsible manufacturing through abatement & mandatory end-of-life management (ALL manufacturers & downstream users)



Fluoropolymers and polymeric PFPEs: meet OECD criteria of low concern (PLCs), do not degrade and do not bio-accumulate (high molecular weight)



The largest share of fluoropolymers waste shall be thermally treated and mineralised – standards for waste management facilities shall be harmonised



State-of-the-art abatement technologies *can* reduce emissions of fluorinated organic compounds to a couple of kgs per year. Permits for Dordrecht facility for emission to air and water took abatement measures into account (around 35 kgs in 2021 vs 8 tons in 2013)

Industry – all EU manufacturers of Fluoropolymers commit to cut emissions

FPG Responsible Manufacturing Programme for European Manufacturing sites

Since the 2021 adoption of the responsible manufacturing principles, all Fluoropolymer Products Group (FPG) members are engaged in concrete actions related to responsible fluoropolymer manufacturing practices.

The undersigned members of the Fluoropolymer Products Group (FPG) hereby commit to an industry Responsible Manufacturing Programme for European Manufacturing sites. The programme is comprised of three pillars:

1. A voluntary commitment to reduce non-polymeric PFAS emissions from our fluoropolymer manufacturing;
2. A platform to promote the adoption of commercially available state of the art technologies to minimise non-polymeric PFAS emissions in our manufacturing; and
3. A commitment to inform downstream users of fluoropolymers on their safe handling and use.

Way Forward – F-Gasses

Low Global Warming Potential F-Gasses (HFOs) should be derogated for key sectors applications (Heatpumps, Automotive, Blowing agents for insulation)

- **Condition:** Mandatory recovery of F-gasses during life, periodic leak-checks, mandatory recovery end of life.



Enable recovery of F-gasses in the End of Life Vehicle Directive (mandatory recycling) and Harmonise leak checks for new vehicles during yearly maintenance control



Impose and enforce regular leak checks for heat pumps maintenance

Additional risk management measures



- The implementation of the additional risk management measures mentioned above could be facilitated by a voluntary commitment which involves all actors of the F-gas supply chain, including manufacturers/importers, distributors, downstream users, research institutes and trade associations.
- Establish a stakeholder platform involving such actors to develop measures such as the set-up of certification systems in a collaborative and constructive manner together with authorities and regulators.

- To provide regulators with an additional option to consider beyond the proposed PFAS restriction, and to avoid potential restriction inflicting high societal cost and damage.
- To increase transparency in the supply chain to further reduce the potential illegal trade of F-gases
- To identify where emissions can be reduced from manufacturing to end of life/waste
To facilitate the development of innovative measures, always with a view to further reduce the impact on the environment
- To develop independent authentication/certification through third parties (e.g. EU EMAS) Note: Some stakeholders are already ISO 14001:2015 certified, which is complementary to EMAS.
- To develop voluntary initiatives to complement existing or future regulatory measures other than the proposed PFAS restriction
- To secure a 'One Voice' for the European Commission and other EU decision-makers, through the value-chain
- To secure reuse, recycling and development of a circular economy
- To secure the green deal objectives in their entirety: from reduction of energy consumption to the greening of solutions
- To provide a neutral support for the entire industry to implement guidelines and proposals developed by the platform, that will be made available to along the supply chain.
- To increase transparency in the supply chain where possible and pertinent through innovative and currently being developed measures such as "Digital twins" or similar

Focus Area I. Automotive sector



Under Construction

Thank you for your attention!