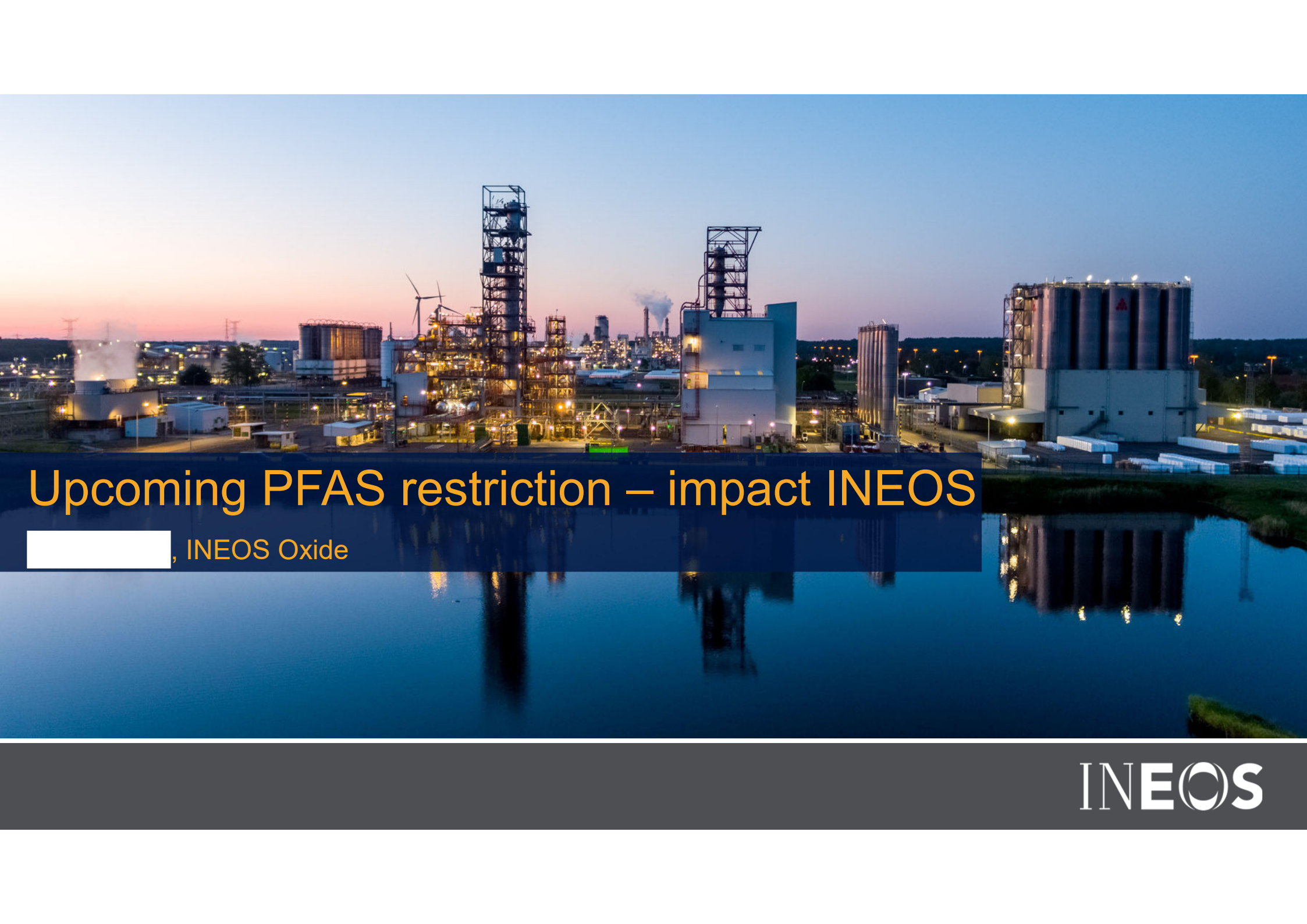


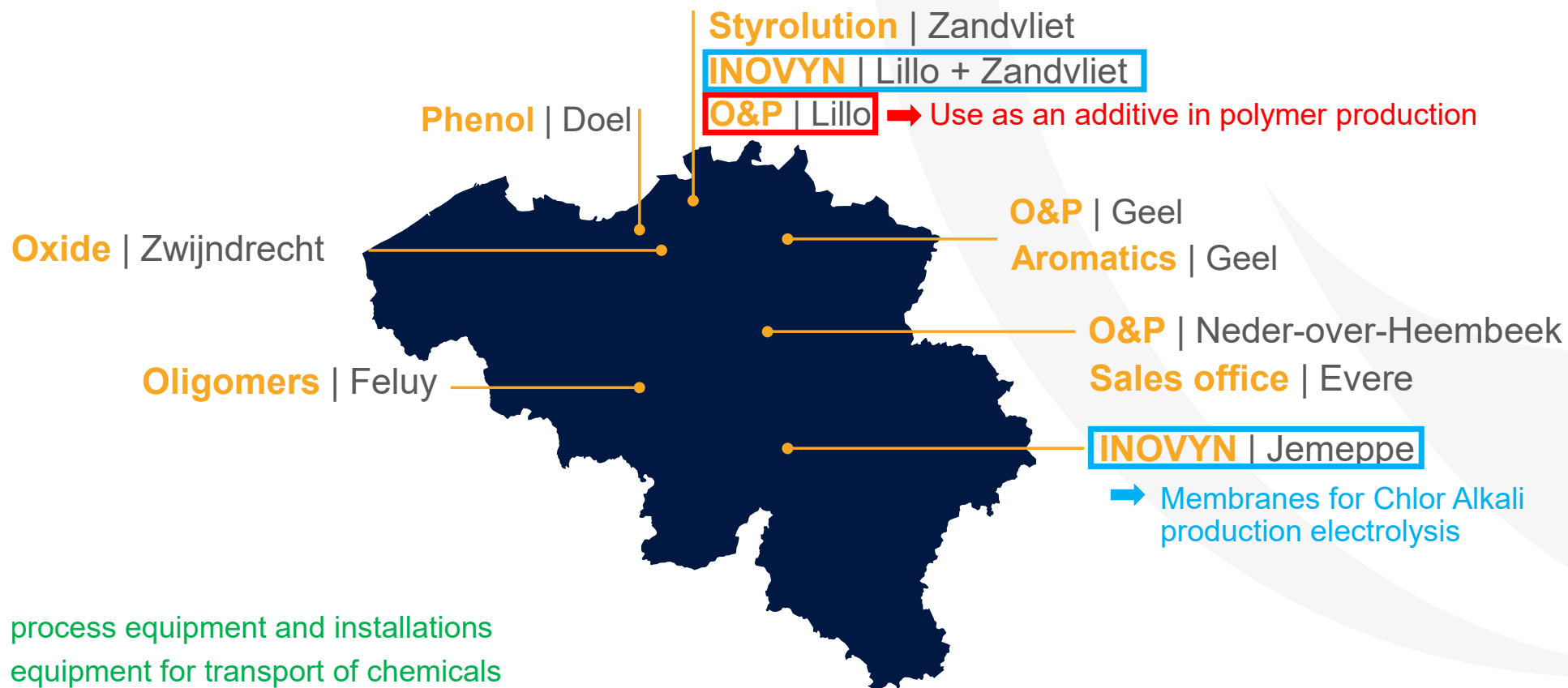


Upcoming PFAS restriction – impact INEOS

, INEOS Oxide

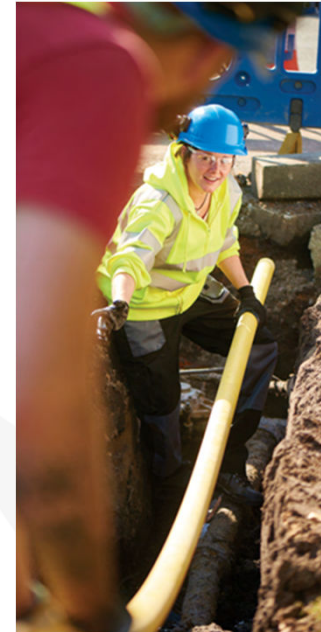
INEOS

EEN GROTE VERSCHEIDENHEID OP DE BELGISCHE MARKT



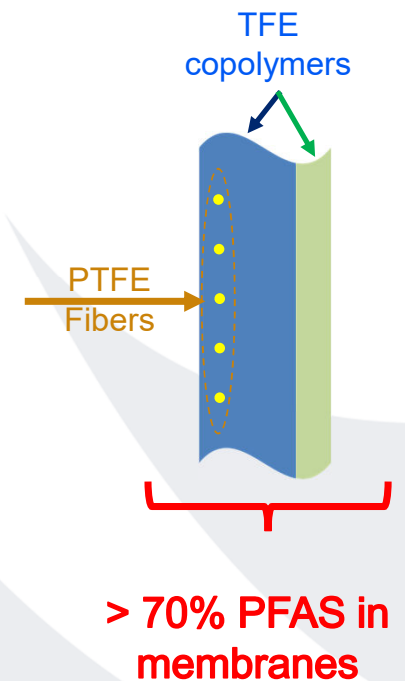
PFAS used as Polymer Processing Aids in Polyethylene

- Applications in HDPE / LLDPE : Pipe, film, small and large blow moulding
 - Fluoropolymers are used to improve the surface aspect of the final product or reduce die build up during processing
- Applicable derogations:
 - Only one use is covered by a derogation (Restriction proposal, paragraph 6a, with explanatory note (11) : *Piping and tubing for drinking water applications*).
 - All other uses in piping systems for gas (standard EN 1555) and for water drainage and sewerage (standard EN12201), or in food packagings are not covered by a derogation.
- No alternatives are known that can bring the same benefits to polyolefin processing
 - The validation of alternatives requires food contact approval
 - Approval time of minimum 3 years for pipes (testing according to ISO9080) once a suitable alternative has been found.
- End of service life:
 - Film: normal recycling streams (mechanical, energy, landfill) – concentrations undetectable
 - LBM + pipe: mechanical recycling
 - Pressure pipes: life-time expectation >100 years (no recycling applicable yet)



Membranes for Chlor Alkali production electrolysis

- INEOS Inovyn Chlor Alkali production is relying on:
 - Membrane technologies (95%) *In Belgium, both sites use membrane technology*
 - Asbestos-free Diaphragm technologies (5%)
- Both technologies are BAT (Best Available Technology) according to BREF document published in 2014 by EU.
- Both membranes and asbestos-free diaphragms are mostly made of perfluorinated polymers covered by the PFAS restriction
- There is currently no alternative to perfluorinated membranes or diaphragms for Chlor alkali production by Electrolysis process.
- Environmental fate at end of service life:
 - Dedicated waste collection by INDAVER for recovery purposes



Process equipment and installations

- Gaskets, joints, sealants, seal rings used in valves
 - Used in Technically Tight valves to guarantee number of cycles (~emissions)
 - Requirements: chemical resistance + mechanical functionality
- Teflon (PTFE) is too flexible in such application and other PFAS are used which are more robust and cause less emissions, such as PVDF, PFA, PCTFE
- For some applications, metal graphite gaskets can be used as an alternative
- PTFE is also used in lubricants, typically for its heat resistance
- Viton is typically used in gloves to protect against aggressive chemicals
- End of lifecycle:
 - Collected together with normal industrial waste for incineration



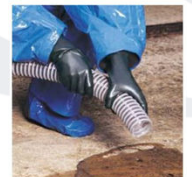
BREATHER DISC SEAL IN PTFE



CAF/PTFE ENVELOPE FLANGE GASKET

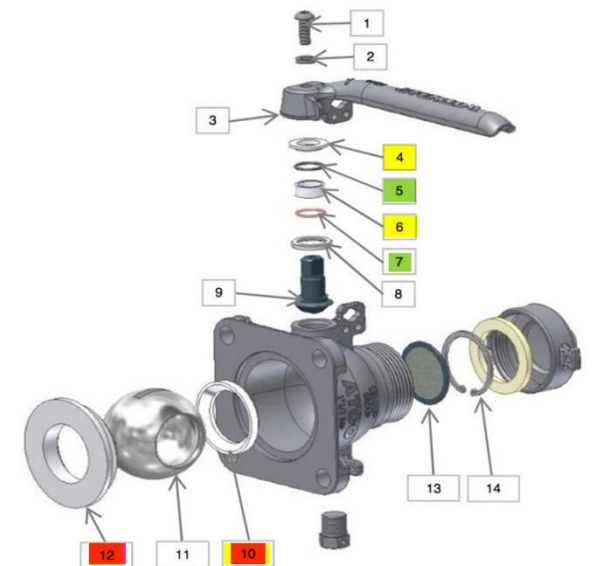


GRAPHITE FLANGE GASKET



Transportation of chemicals

- Valves in transport sector should be resistant against:
 - Large changes in pressure
 - Agressive chemicals
- Seals/O-rings/gaskets play an important role in valves
 - PTFE is often only option due to its mechanic flexibility
 - In some cases, a graphite core (for strength) is used surrounded with PTFE for its chemical resistance



- : PTFE
- : other PFAS containing materials
- : PTFE/graphite

- End of lifecycle:
 - Collected together with normal industrial waste for incineration

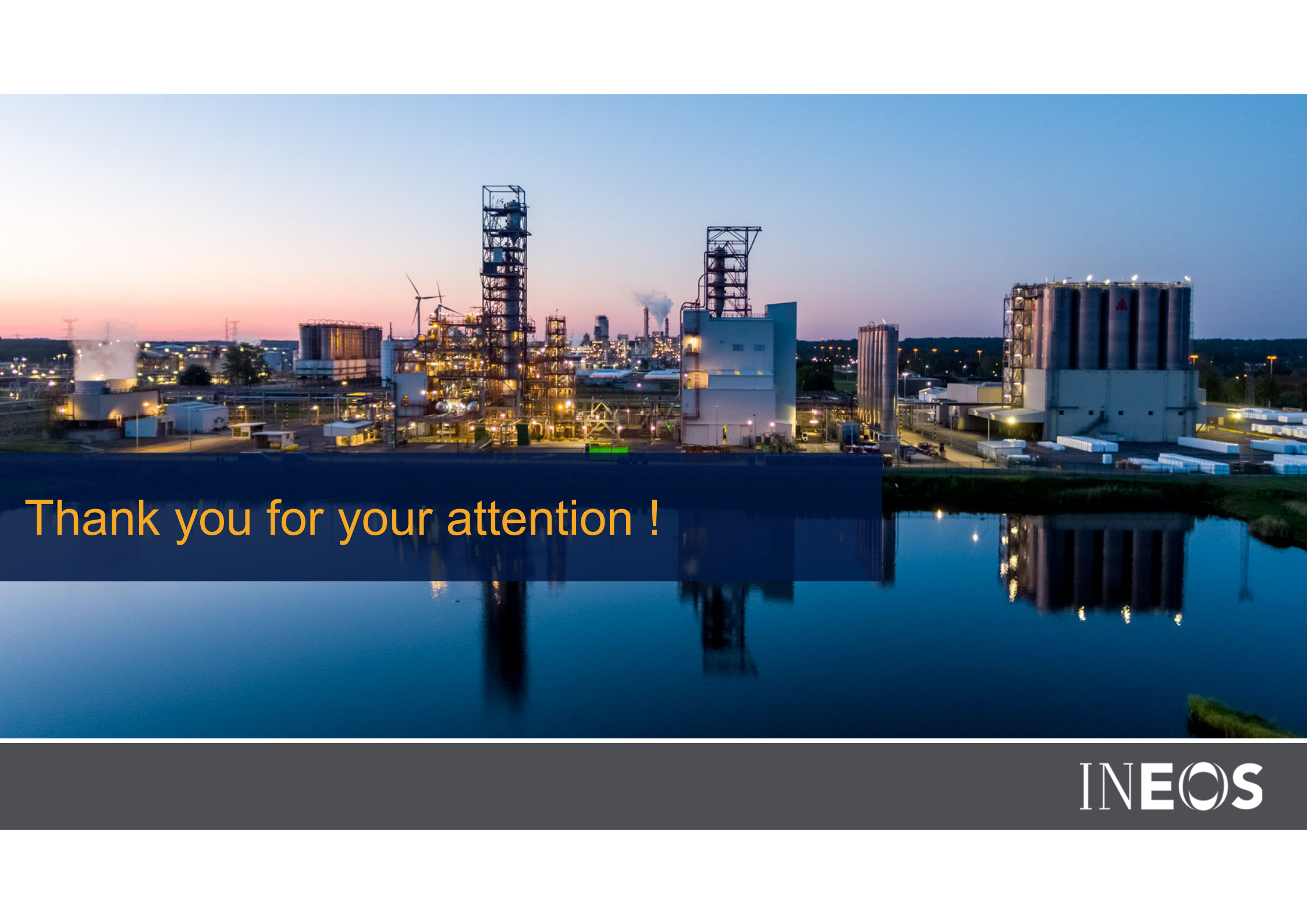
INEOS Automotive



- Production site in France (currently Mercedes-Benz, near future INEOS Grenadier)
- PFAS are involved in the automotive sector in several ways:
 - PFAS containing refrigerants
 - Alternatives exist (eg. ammonia, alkanes, CO₂), but they are not easily interchangeable because of their different thermodynamic properties or their downgraded cooling efficiency and a high risk of fire in case of a leakage after an accident
 - Eg. Mercedes-Benz S-class uses R744 (CO₂ based): system works under higher pressure, requiring thicker pipes, which is more weight, requiring more power, resulting in a higher consumption
 - Many components in the car may contain PFAS, as lubricants, high T resistant insulators, textile coating, electronics, ... (to be checked in the IMDB database)
 - The production unit is equipped with dozens of chillers using fluorinated refrigerants
 - Painting facilities equipped with AR-AFFF systems containing PFAS
 - The production unit has very specific fire protection systems in the data centers, using 1,1,1,2,3,3,3-heptafluoropropane

INEOS contacts per application:

- O&P: @ineos.com
- Inovyn: @inovyn.com
- Automotive: @ineos.com
- General use of PFAS in industrial installations: @ineos.com
- General use of PFAS in transport sector: @ineos.com



Thank you for your attention !

INEOS