

LesSF₆

Reducing SF₆ emission by solving (complex) leakages



cigre

For power system expertise

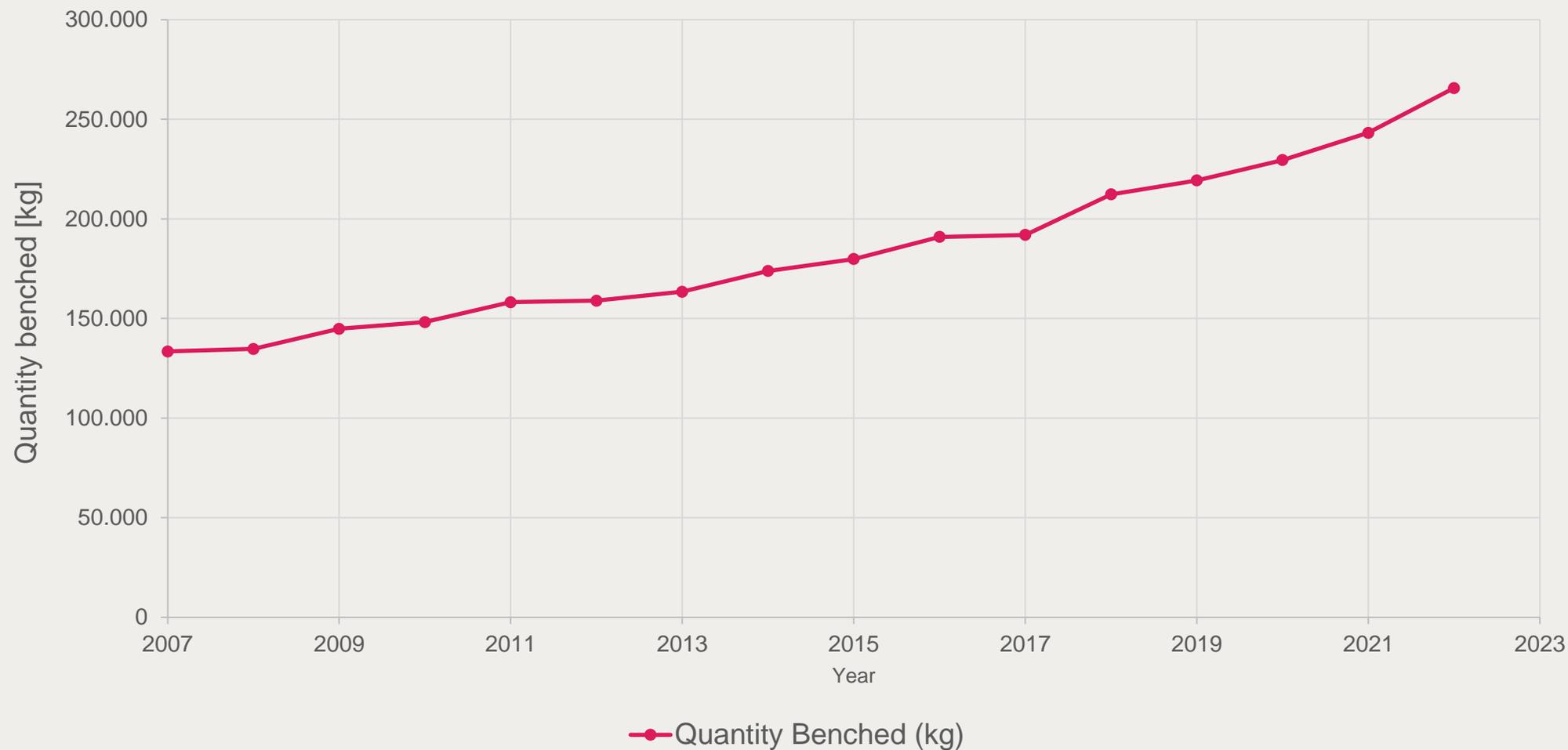
Reducing SF₆ emission by solving (complex) leakages

- We use SF₆
- >50 years and still in service
- Wide variety of switchgear
- HV-switchgear is not gastight
- Dealing with leakages;
 - solve it,
 - experiments (case independent).
- **Take action!**



Banked SF₆ in the Netherlands*

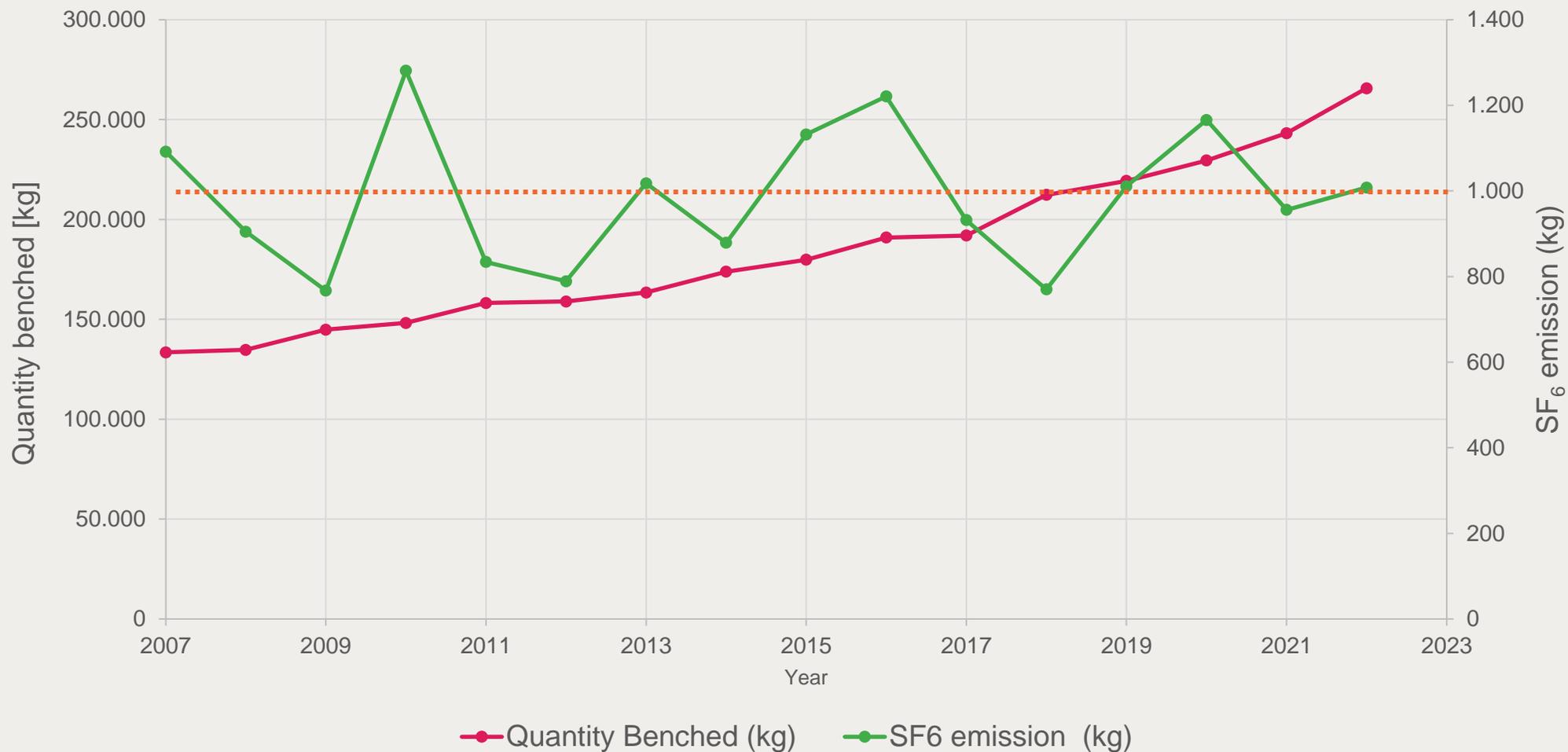
Banked SF₆



* DSO's and TSO

Banked SF₆ in the Netherlands*

banked vs SF₆ emission



* DSO's and TSO

SF₆ emission

- Solving leakage can be divided into;
 - Simple leakage;
 - e.g. gasket or bonding,
 - easy to solve,
 - experience.
 - Complex leakage;
 - leakage due to material (e.g. welds),
 - difficult to reach or long down-time,
 - safety (barriers).
 - Pareto (80/20)



Goal and initiative

- Quickly seal leaks
- Innovation project Reddyn
- TenneT, Liander, Qirion and DEP
- approach:
 - ✓ desk study
 - ✓ market consultation
 - ✓ criteria
 - ✓ lab testing
 - ✈ field testing



REDDYN

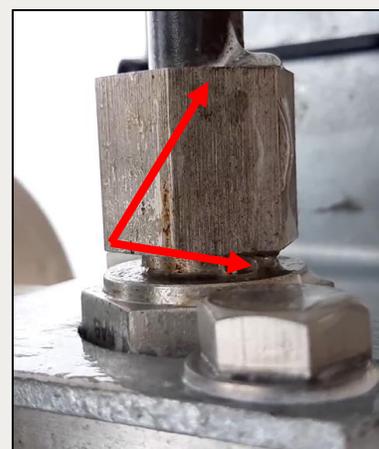


Qirion



Differentiation of SF₆ leakage

- Leakage divided by type:
 - welding
 - o-ring or gasket
 - flanges
 - piping
 - bursting disc
 - cast metal



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REDDYN



tennet



Liander

Qirion



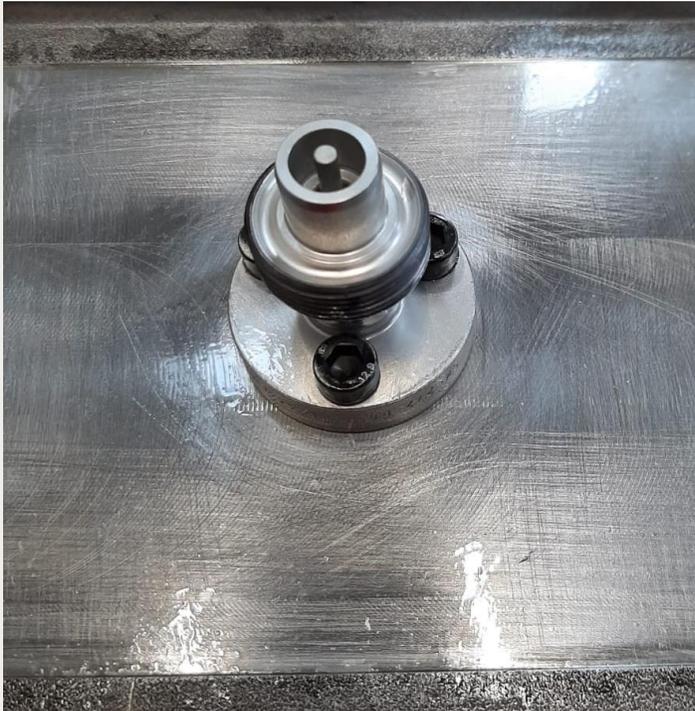
(e) duurzaam
energie
perspectief

Testing in the laboratory

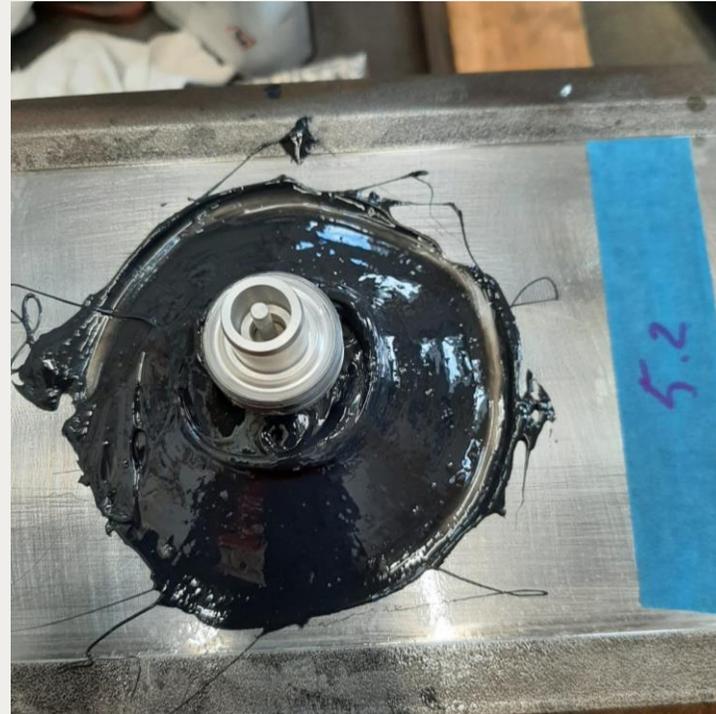
- three test compartments
- nitrogen-filled
- 48 couplings
- difficult to simulate a leakage
- reproducible
- worst-case
- selected products
- Three tests for each combination



Findings



Pre-treatment:
Sanding and cleaning



Applying product:
Putty and main product or just main product



Removal:
Simplicity and damage

Fieldtest | Pratical examples

- four different leaks on a GIS
- minor leaks
- two succesful at 2,5 bar



Fieldtest | Pratical examples

- one succesful at atmospheric pressure



Fieldtest | Practical examples

- one unsuccessful at 2,5 bar



Conclusion of the project so far

- Information collected;
 - drying and curing times,
 - ease of application,
 - removability.
- lab test:
 - application at atmospheric pressure successfully tested up to 7 bar,
 - successful application up to 1 bar.
- field test:
 - successful application up to 2,5 bar.
- complex leaks and temporarily?



Next steps

- more field testing,
- impact products on SF₆ quality and material,
- climate and impact proof (partly tested by suppliers),
- potential of the products in practice (lab vs field).



One more thing....

Keep reducing SF₆ emissions!

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