

Paris Session 2022



SF₆ leakage reduction from EHV-GIS by advanced gas tightness and N₂/SF₆ mixture

B3

Pref. Subject 2 Question PS2.2

Satoru MAENO (Japan)



Question PS2.2

- Much development has taken place to reduce SF₆ impact on the environment from utility application for electrical insulating and interrupting equipment. What are likely to be the enduring **initiatives to prevent SF₆ gas leaks** and find a possible alternative to SF₆ for GIS applications?

Answer

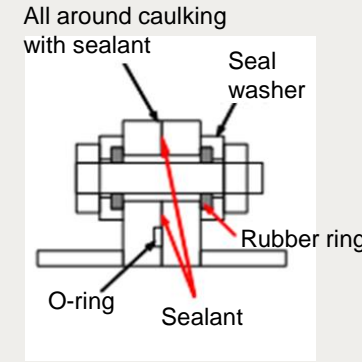
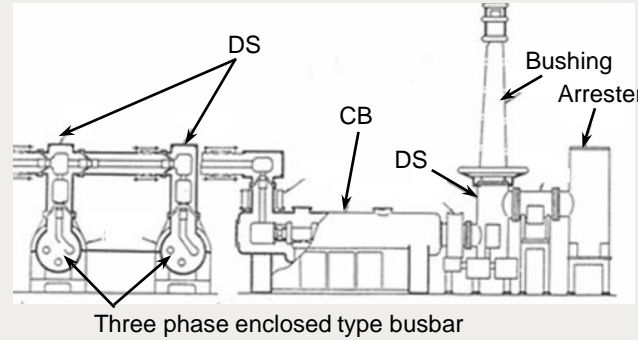
- How to reduce SF₆ leaks from aged EHV-GIS?
 - >> Changing to advanced gas tightness (0.5%/year -> below 0.1%/year)
 - >> Retrofitting the GIS with N₂/SF₆ mixture (down to 50% to 67% SF₆ amount)

Issues/solutions of aged EHV-GIS SF₆ leakage

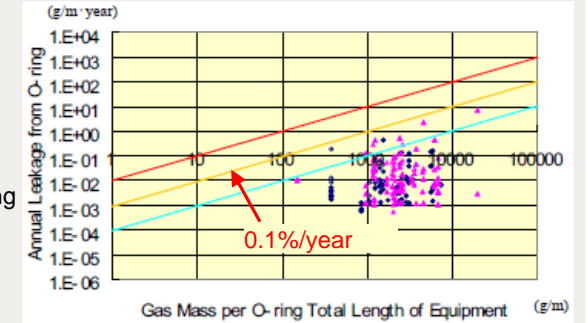
Issues

- Large SF₆ amount
- Ageing of gas tightness

e.g. 0.5 -> 2 %/year after 30 years,
0.5 -> 1.29 %/year (reported in a literature)



(a) Structure of flange



(b) Field data of SF₆ leakage

Figure 1: Gas tightness structure and its field data

Solutions

- Advanced gas tightness with seal washer and sealant
->> SF₆ leakage was below 0.1 %/year even after 10 to 20 years operation (Fig. 1)
- Retrofitting the GIS with 75%N₂/25%SF₆ mixture
->> down to 50% to 67% SF₆ amount (Fig. 2)

Group Discussion Meeting

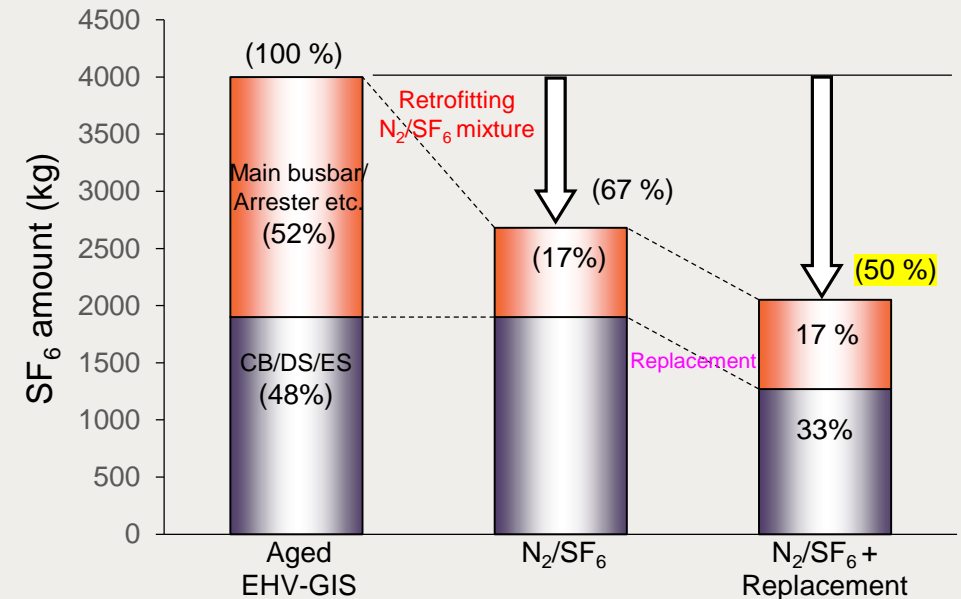


Figure 2 : SF₆ amount reduction by N₂/SF₆ mixture and replacement

Evaluation of effects for aged EHV-GIS

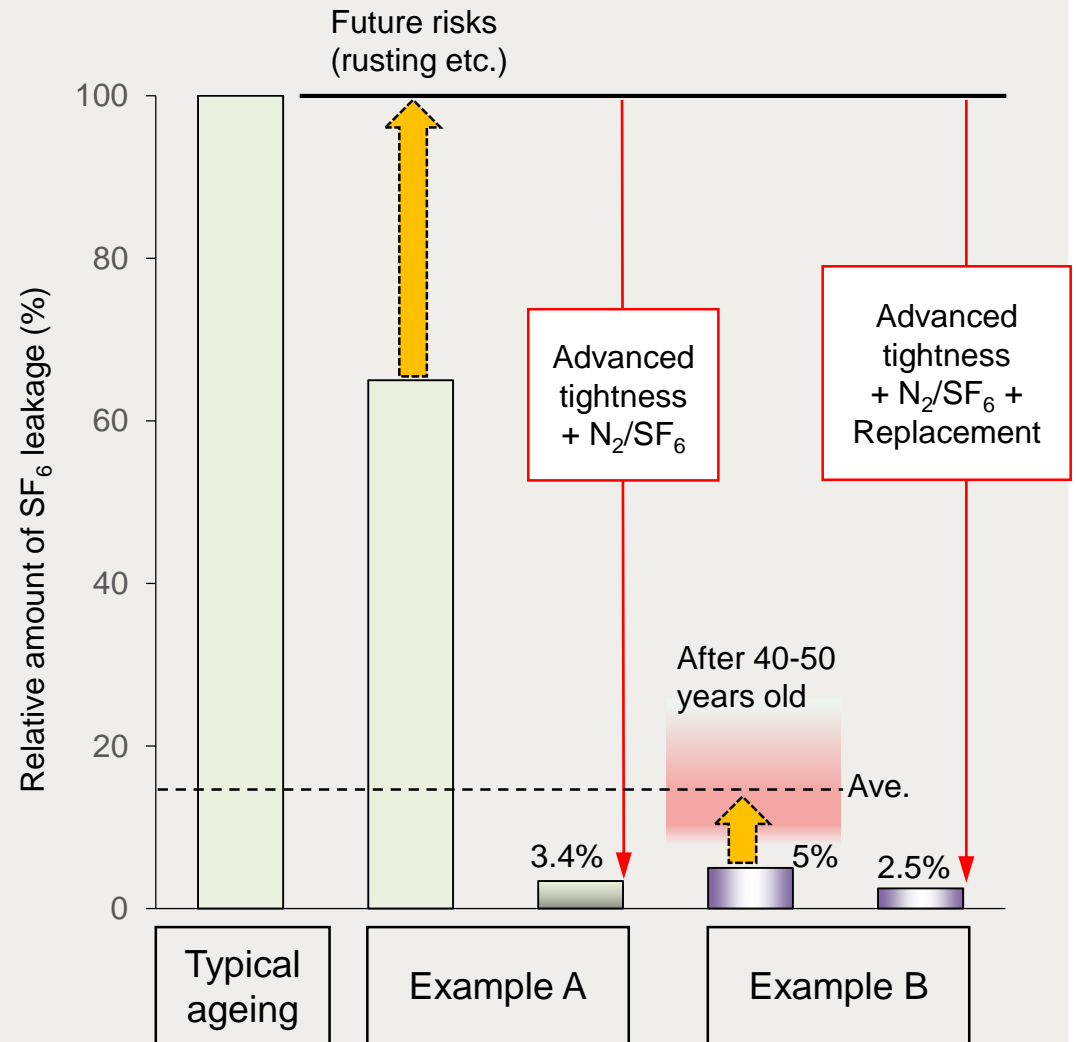
<SF₆ leakage by ageing>

- Typical ageing (by rusted flange)
 - ✓ 0.5%/year -> 2%/year after 30 years
- Example A (Normal gas tightness)
 - ✓ 0.5%/year -> 1.29%/year (will reach 2%/year)
- Example B (Advanced gas tightness)
 - ✓ 0.1%/year -> 0.3%/year over 40 years operation

<SF₆ leakage reduction for Examples A/B>

- Example A : 2%/year
-> 0.1%/year leakage + 67% SF₆ amount : 3.4%
- Example B : 0.3%/year
-> 0.1%/year leakage + 50% SF₆ amount : 2.5%

Group Discussion Meeting



Summary

- **SF₆ leakage from aged EHV-GIS is one of the biggest issues.**
 - **Solutions**
 - ✓ Applying advanced gas tightness techniques
 - ✓ Retrofitting EHV-GIS with N₂/SF₆ mixture
- >> SF₆ leakage can be drastically reduced for two examples of aged EHV-GIS.