

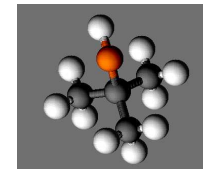


Evaluation of The New Low Sulfur Odorants

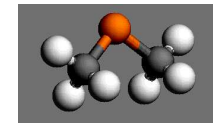
A. Seo, T. Matsubasa and Y.Gomi
Tokyo Gas Co.,Ltd.

Objectives

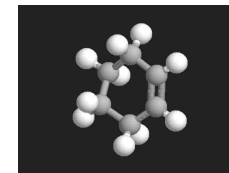
- To develop next generation odorants with low sulfur content.
 - To decrease the Sulfur emissions
 - Present Odorants:
 - Tertially Butyl Mercaptan
 - Dimethyl Sulfide
 - Tetrahydrothiophen
 - Alternative Odorants:
 - TBM + Cyclohexene



TBM



DMS



CH

Odorant Assessment

- We must keep the security level as high as the present level.
- How can we quantify the security level?

Conventional Method

Odor quality and odor strength
Soil permeability
Water solubility, chemical stability

Newly Proposed Method(1)

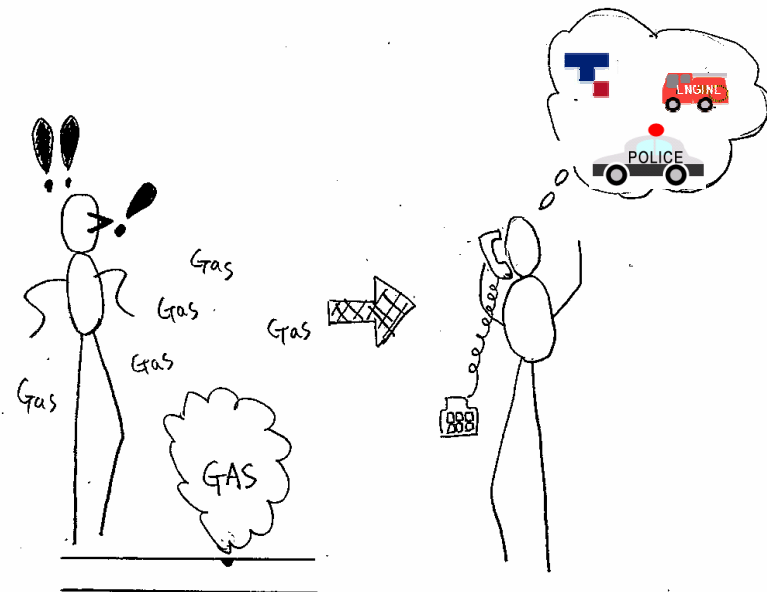
Emergency Call Ratio(ECR) as a
comprehensive index of odor
function

Newly Proposed Method(2)

Three dimensional gas dispersion test
in soil

What is The Odorant Performance?

- It is necessary that in case of gas escapes, not only the consumers can notice the smell but also they realize their dangerous situations, and finally they report the gas escape to their gas company, the fire station or police station.
- The security level is propotional to the number of gas escape reports.
- The comprehensive index can be made by **Emergency Call Ratio**.



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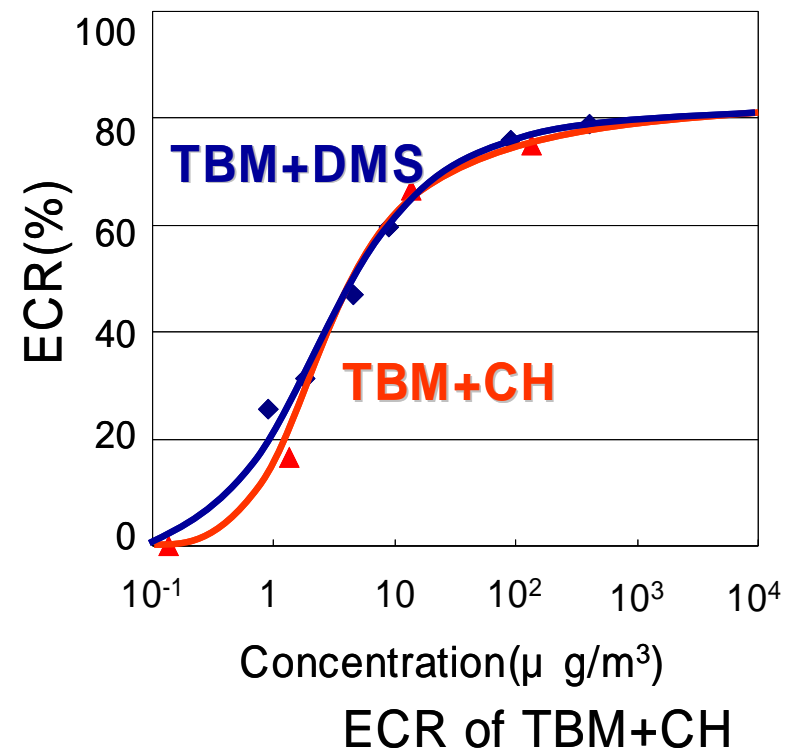
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ECR question in Olfactory tests:

“Do you report a gas escape possibility to the gas company or fire stations or police stations when you smell this odor?”

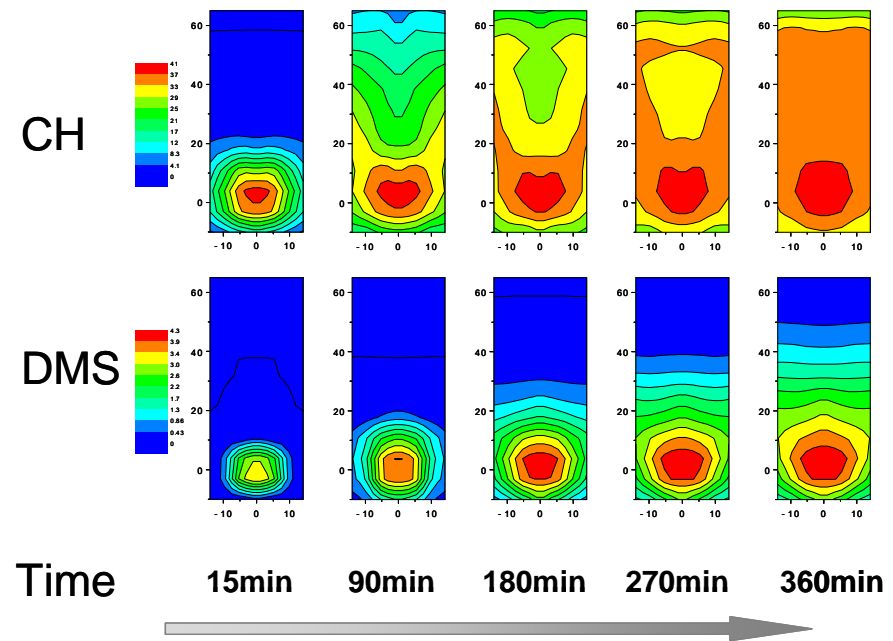
Emergency Call Ratio (ECR)

- TBM+CH had an identical ECR curve to TBM+DMS.
- The new odorant has an enough potential to warn the consumers by its distinctive TBM-based odor.
- The security level can be maintained.
- The ECR can be a comprehensive index.
- Other tests including soil permeability test were conducted.



Soil Permeability Tests

- Three dimensional concentration distribution was experimentally measured.
- Diffusion was dominant rather than flow dynamics.
- CH has more soil permeability than DMS.
- We are now trying to make numerical simulations.



Contour of CH and DMS Concentrations



Conclusions

- New odorant assessment method was investigated.
- New low sulfur odorant blend of TBM+CH was evaluated.
- TBM+CH was found to have an excellent potential as an alternative odorant blend of TBM+DMS.
 - TBM+CH can reduce sulfur content by 60%.
 - TBM+CH was confirmed to have a very similar ECR trend to that of present odorant.
 - Soil permeability of CH was much better than DMS.
- Other tests are in progress for the final check and we are now preparing for the field tests.