

TIPS ON THE APPLICATION OF THE SF₆ TRACER TECHNIQUE FOR METHANE MEASUREMENT

Laboratory

1. In setting up a SF₆ tracer facility get a gas physicist involved.
2. Analyse samples in triplicate.
3. All newly manufactured yokes must breathe for at least a month prior to use to get rid of excess glue fumes. Pressurising with nitrogen gas and evacuating several times is also required.
4. Discard samples (yokes) with ambient pressure unless one is sure that vacuum was lost at the end of the collection period.
5. Avoid the enrichment of laboratory with tracer. Tubes must be filled with SF₆ in a separate room to where analyses are conducted. Ideally, yoke evacuation would also be conducted in a separate room from the analyses.
6. Explore reasons for concentrations of SF₆ outside the normal range.
7. Sample inlet in the harness should have an inverted 'Y' to avoid easy blockage by mud or water
8. Capillary length can be shortened by using a 10 cm length and pressing (use a vice) one end with a smooth surface metal. Leave room for the ferrules.
9. During the sampling period vacuum in yokes should not be exhausted beyond one half. Adjust air flow through the capillary.
10. Halters yielding abnormal sample pressures in the yoke should be replaced.
11. Permeation tubes should be used as soon as possible after 10–12 weeks calibration, while in linear mass loss.
12. Once dosed the known permeation rate is warranted for approximately 3–4 months (depending on charge and permeation rate). Beyond this period of animal deployment, a new re-calibrated permeation rate following tube recovery should be used for calculating CH₄ emission at the time of trial.
13. Maintaining sibling tubes in laboratory to estimate permeation rates of tubes deployed in animals over long periods may not be accurate due to independence of individual tubes.

Field

14. In any single experiment the rates of permeation of SF₆ from tubes should be in a narrow range.
15. Balance the permeation rate among treatments.
16. Be sure that SF₆ tracer concentration in the ambient air is low. Run a pre-trial collection of ambient air to ensure that the experimental area is free of SF₆ sources (e.g. power stations).
17. Be sure that experimental animals have no permeation tubes from previous experiments. If unsure run a pre-dosing sample collection from participating animals.
18. Record carefully the animal numbers and corresponding permeation tubes dosed.
19. Avoid physical damage to permeation tubes during dosing.
20. Be sure that permeation tubes are swallowed.
21. Trials should be initiated at least 5 days after the permeation tubes were dosed.
22. Gas collection period should involve at least four consecutive days.

23. Background ambient air samples (2–3) should be collected simultaneously with collection of breath samples. Location of collection points should face the predominant wind direction before air is enriched by animal emissions.
24. Number of animals per treatment should be the largest as practically possible or use experimental designs that minimise effects of animal and technique variance.
25. Sample collection apparatus (halters and yokes) should be fitted loosely but safely to the animal, ensuring normal drinking, grazing bite size, chewing and rumination.
26. Ensure that yokes are at full vacuum immediately prior to the start of sample collection
27. Ensure that animals are acclimatised (trained) for at least 3 days to the sample collection apparatus. Use training halters and ‘dummy’ yokes for it.
28. Personnel should be properly trained with the protocol.
29. Facility for animal handling should allow an easy flow, free of obstacles which may damage equipment.
30. During sample collection period, the same routine should be followed every day. This should enable efficiency of collection in the shortest time possible. Grazing animals have limited time for essential activities (grazing, ruminating, milking, etc.)