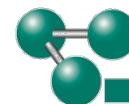


# Miljø-Teknologi AS

**Ingen** tar oss på lukta!

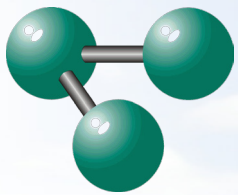
Siv Malmanger

31.10. 2013



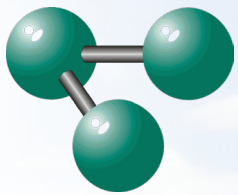
**Miljø-Teknologi AS**

[www.mtgruppen.no](http://www.mtgruppen.no)



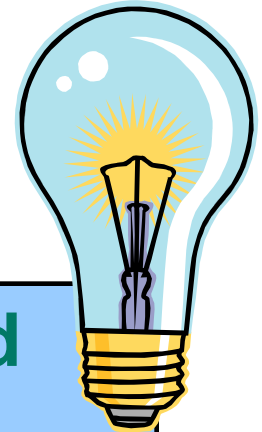
# Agenda

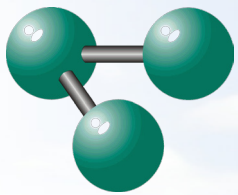
- Kort om Miljø-Teknologi
- Hva er lukt
- Hvordan jobber vi med lukt?
  - Spredningsberegninger og kartlegging
  - Løsninger for lukt i pumpestasjoner og på renseanlegg



# Visjon

Vi skal gi mennesker i kontakt med  
forurensede miljøer en bedre hverdag.





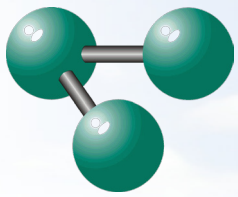
# Miljø-Teknologi

- Har jobbet kun med lukt siden 1994
- Ledende på lukt og gassrensing i Scandinavia
- Ledende gjennom markedsrettet utvikling og kundeservice
- Godkjent for ansvarsrett



**Miljø-Teknologi AS**

[www.mtgruppen.no](http://www.mtgruppen.no)

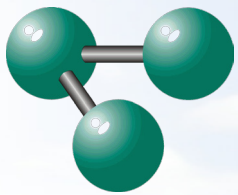


# Våre kunder

- Avløpsrenseanlegg
- Næringsmiddelindustri
- For industri
- Fisk og fiskeforedling
- Avfallsbransjen
- Biogass
- Laboratorier
- Prosessindustri
- Cruiseskip
- Oljeselskap

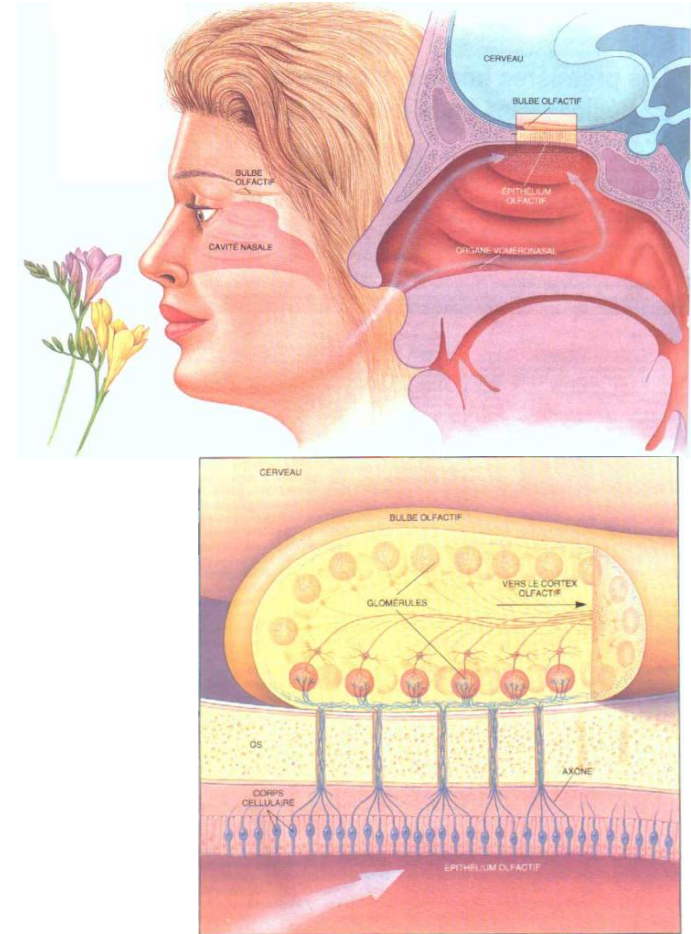
**Liberty of the Seas**



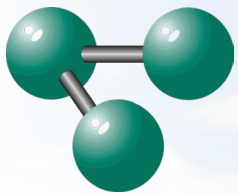


# Hva er lukt?

- Kjemisk sans
- Ca 6 millioner reseptorer (Hunder har 220 millioner)
- Detekterer minst 10.000 ulike stoffer
- Fettløselige stoffer har lavest lukterskel



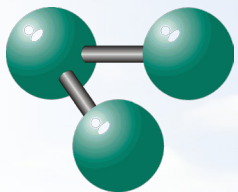




# Lotto

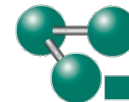
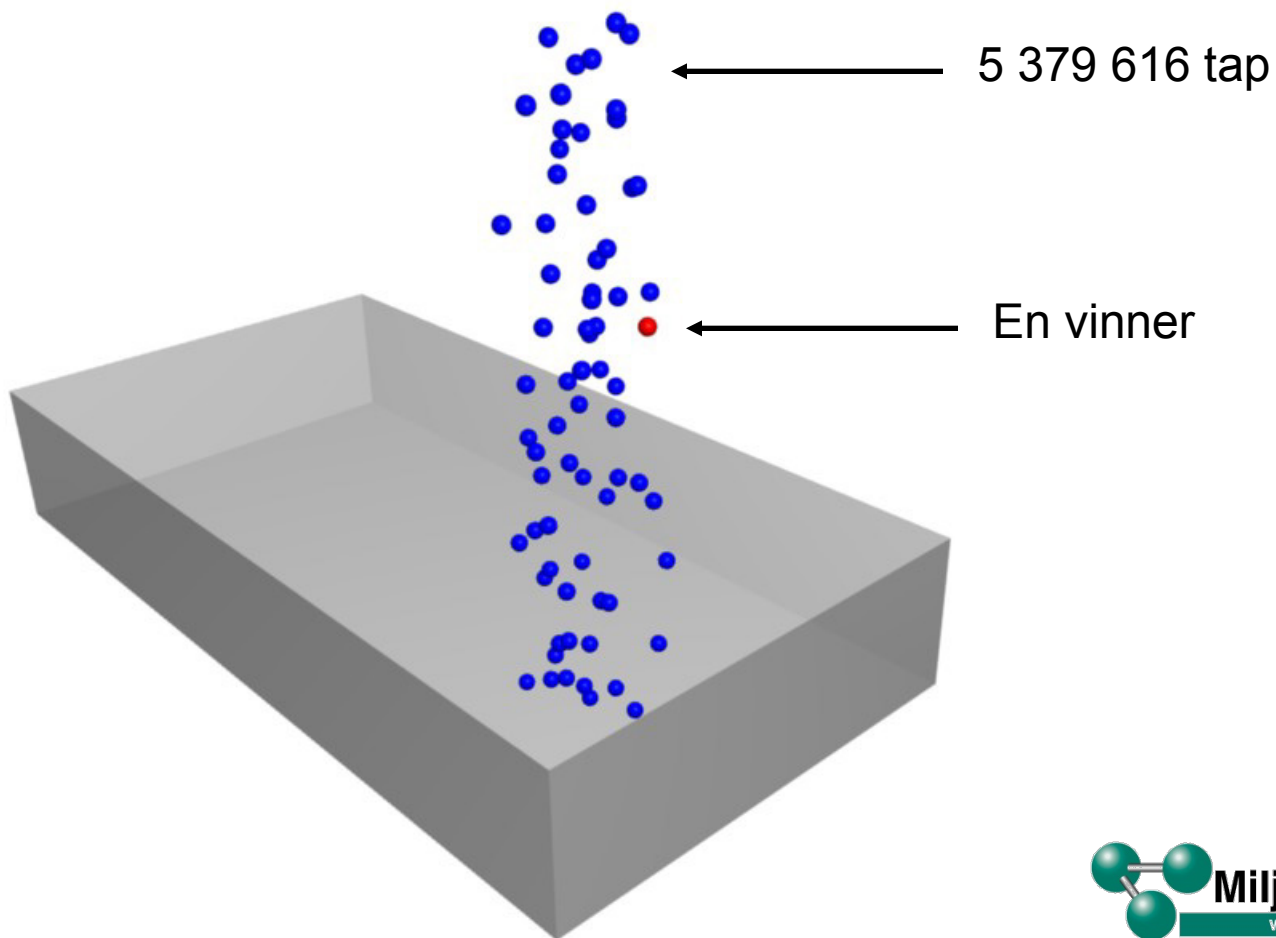
0.00002% sjanse for 7 rette





# Lotto

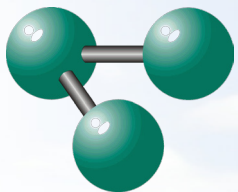
0.00002% sjanse for 7 rette



**Miljø-Teknologi AS**

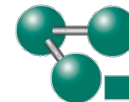
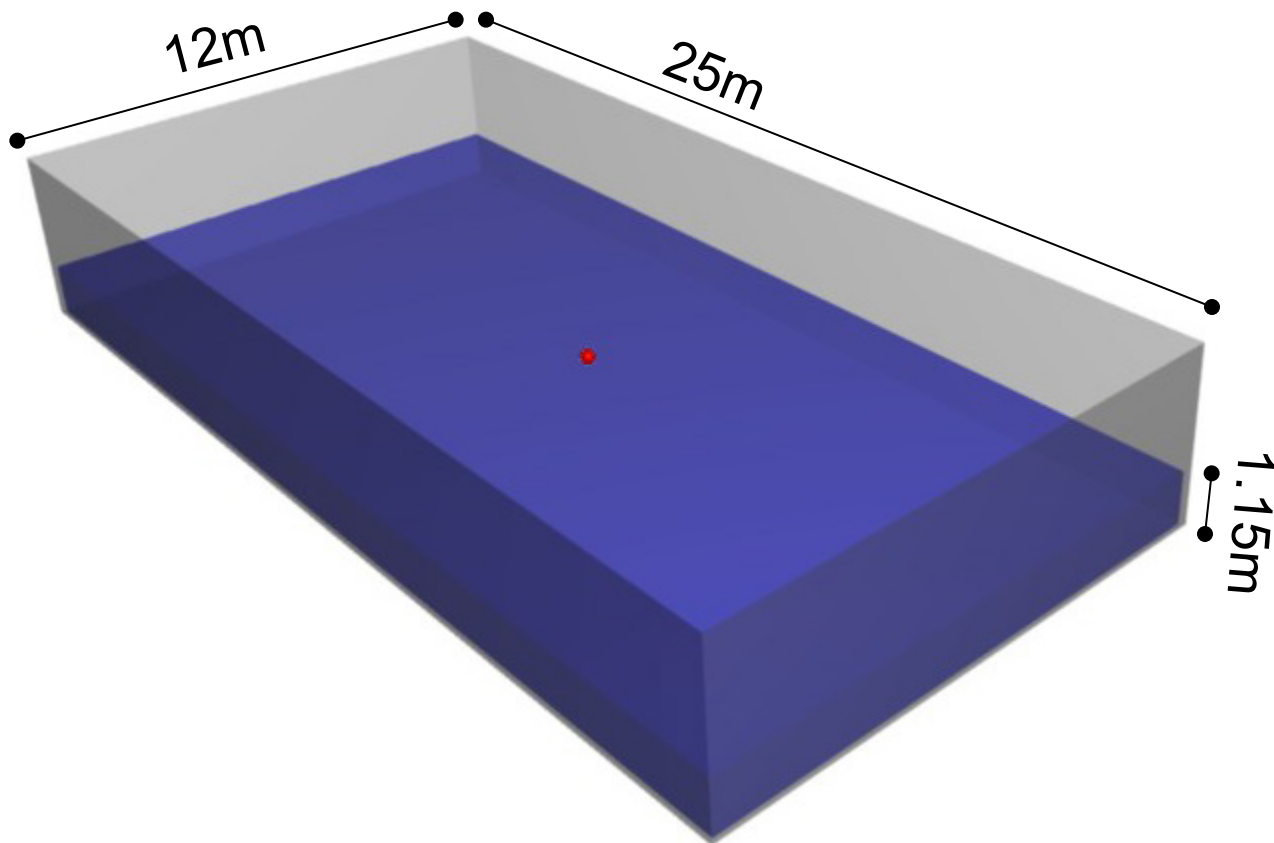
[www.mtgruppen.no](http://www.mtgruppen.no)

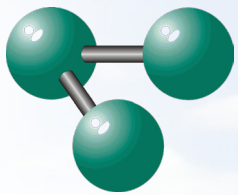




# Lotto

0.00002% sjanse for 7 rette

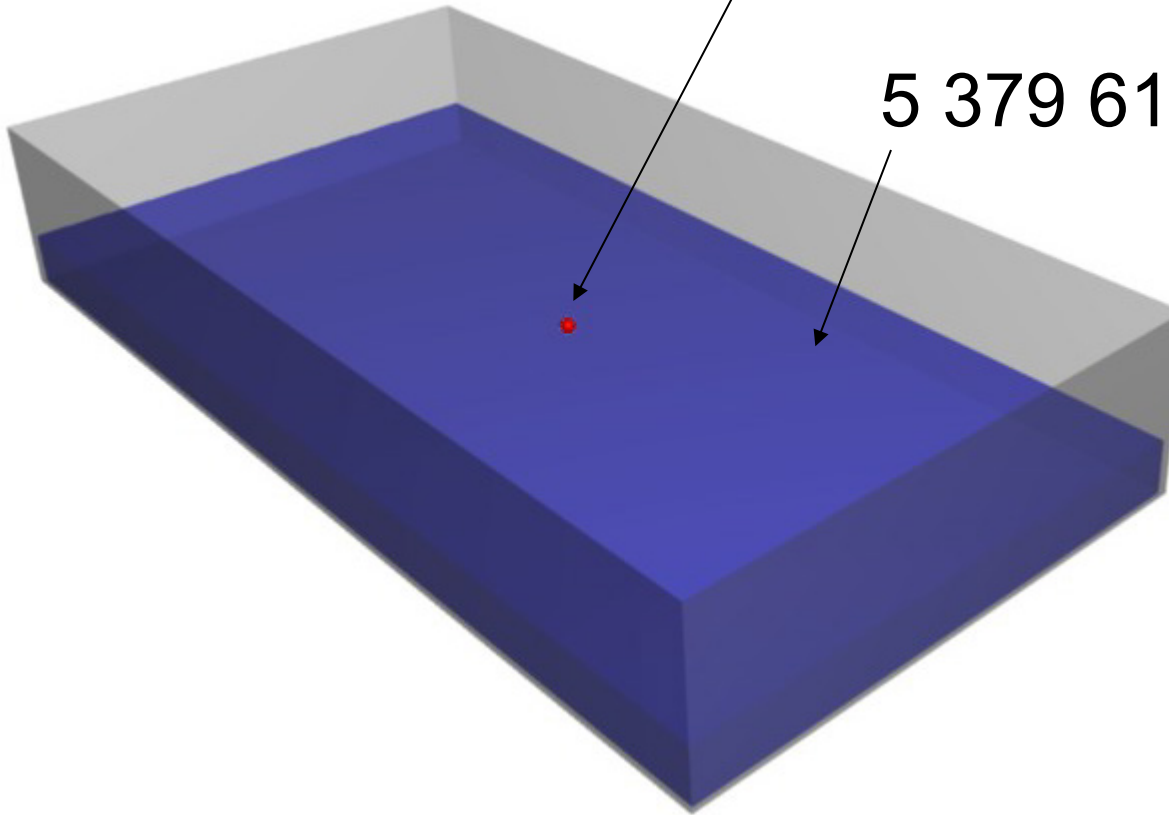




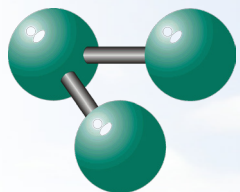
# Lukt

Ett H<sub>2</sub>S molekyl

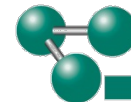
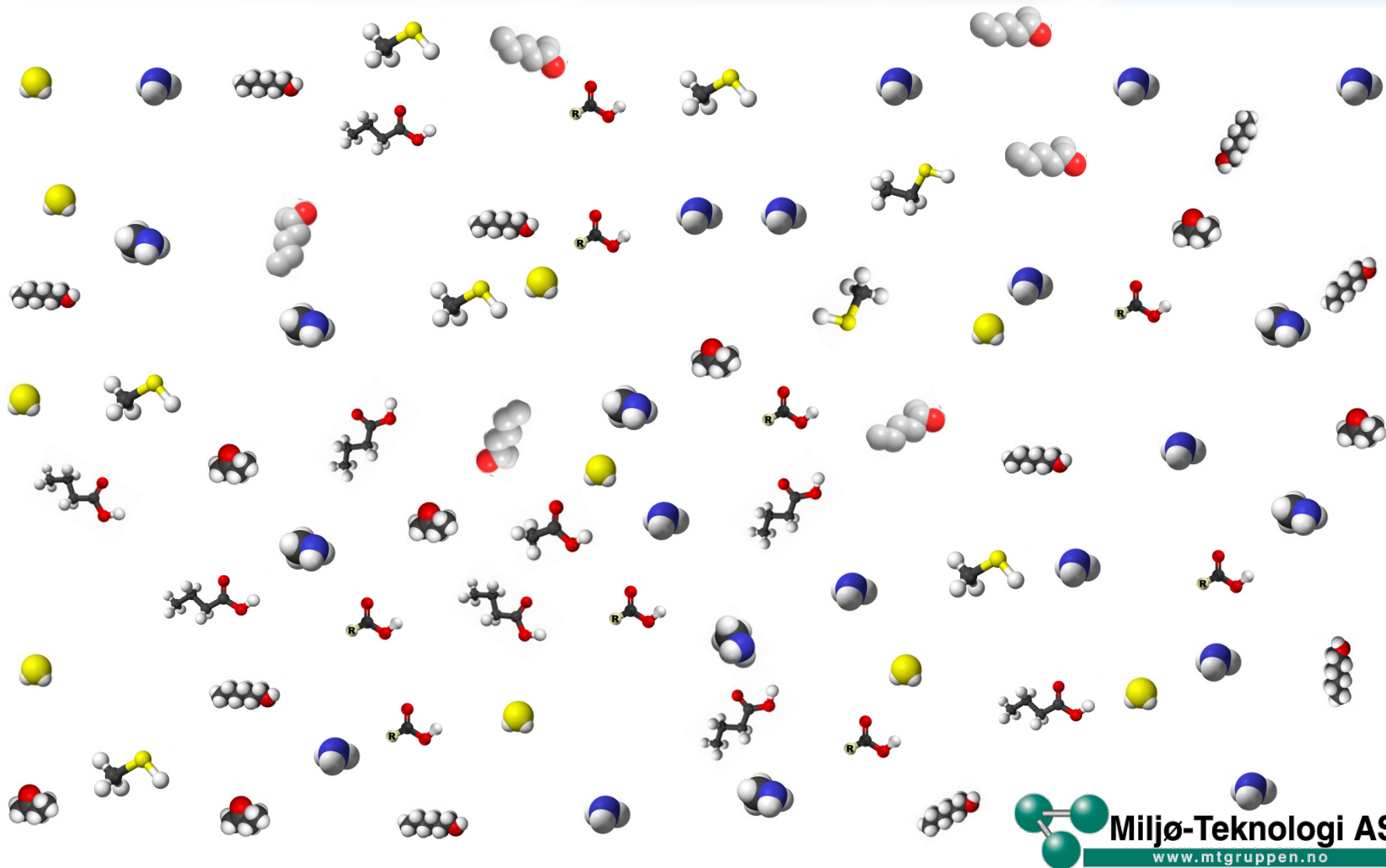
5 379 616 luftmolekyler



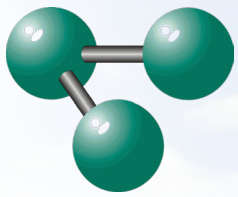
## Alle kjenner lukten !



# I praksis ser vi dette ....

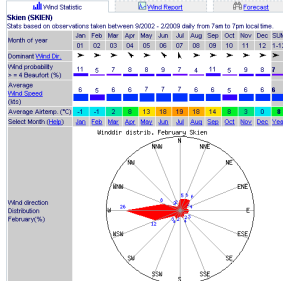


**Miljø-Teknologi AS**  
[www.mtgruppen.no](http://www.mtgruppen.no)

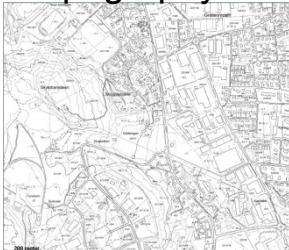


# MT-Odotech spredningsberegninger

## Weather data



## Topography

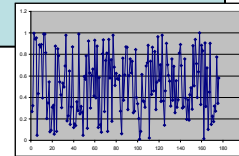


## Odour data

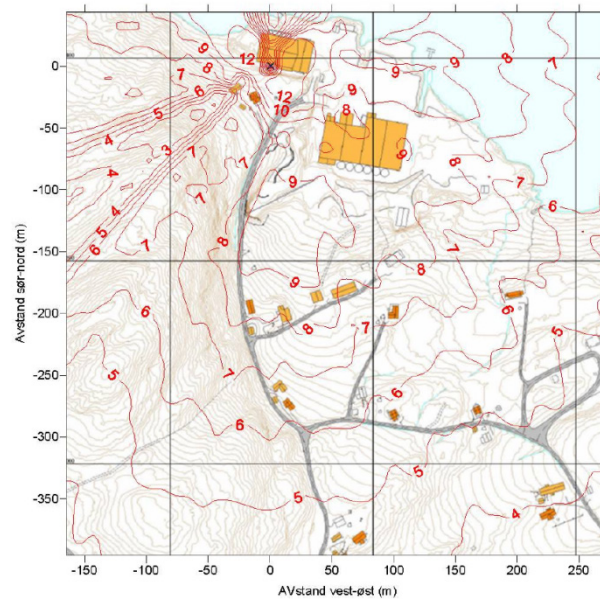


**Model**  
i.e OML / Aermod

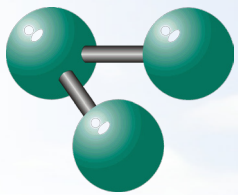
**Time series**



**Statistics**  
i.e. 99% or 98%

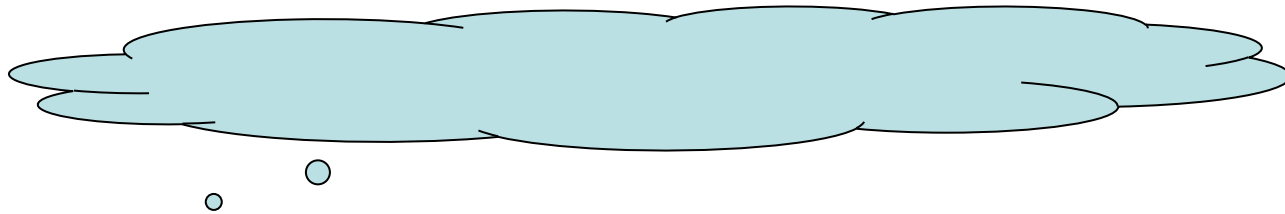


**Miljø-Teknologi AS**  
[www.mtgruppen.no](http://www.mtgruppen.no)

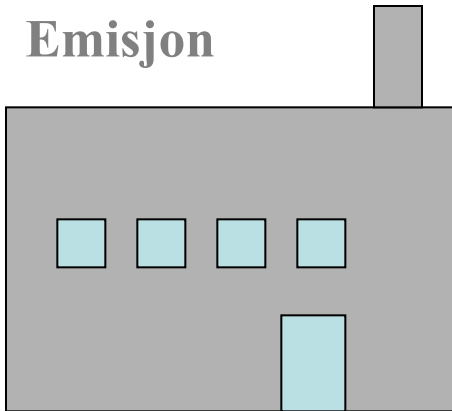


# Gjennomføring av luktmålinger

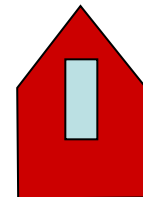
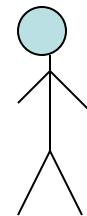
- Innsamling av luktprøver
- Luktpanel
- Luktspredning



Emisjon

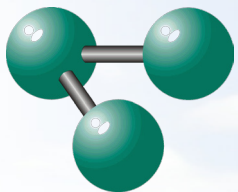


Immisjon



**Miljø-Teknologi AS**  
[www.mtgruppen.no](http://www.mtgruppen.no)



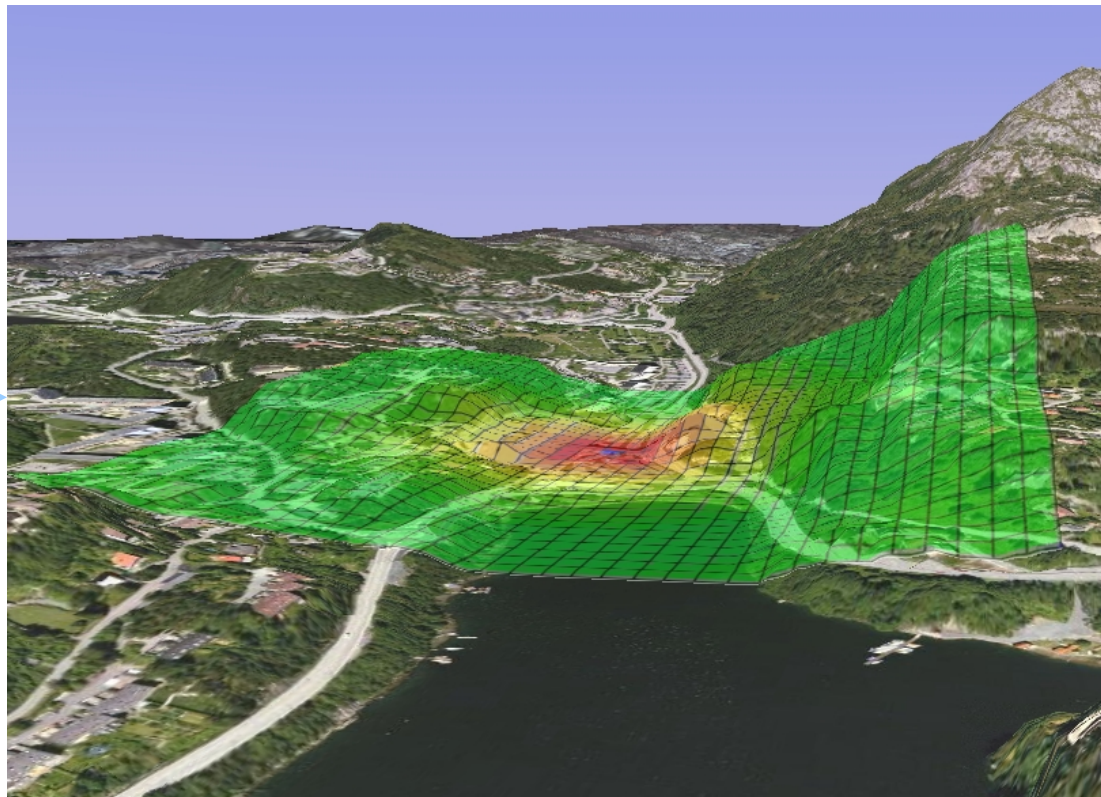
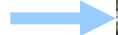


# Spredningsberegninger

Topography



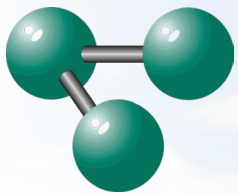
Model  
SCREEN3



Odour data



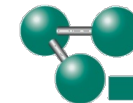
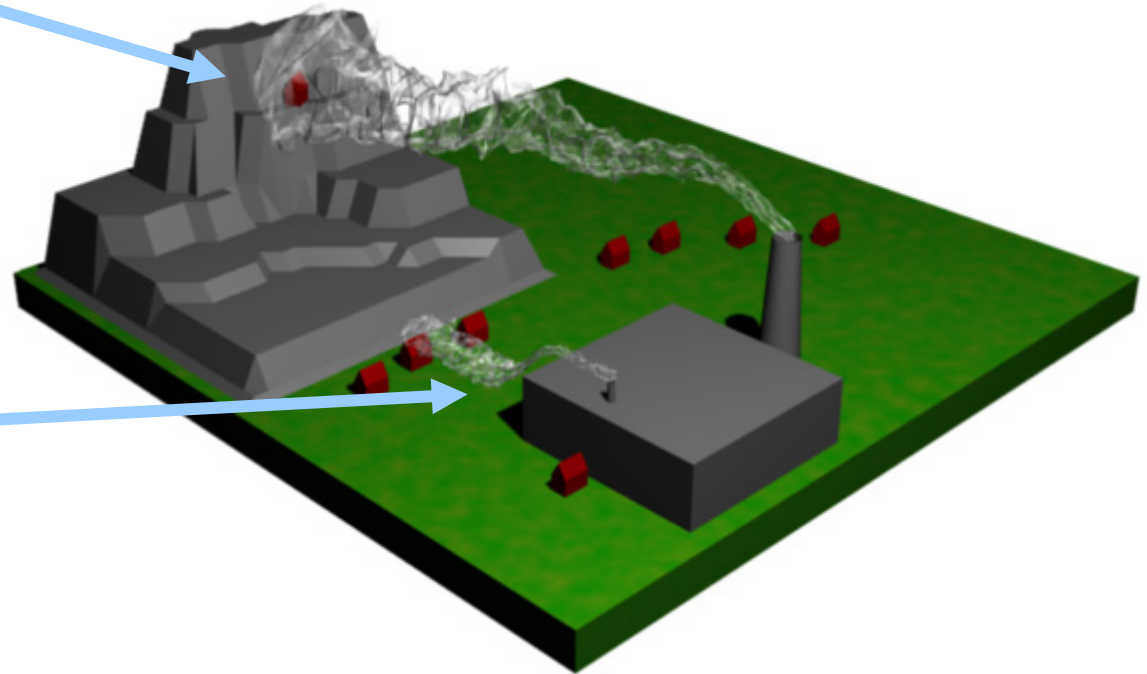


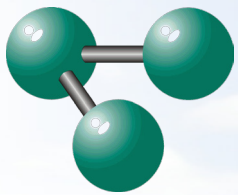


# Spredningberegninger

- Complex terrain

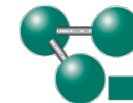
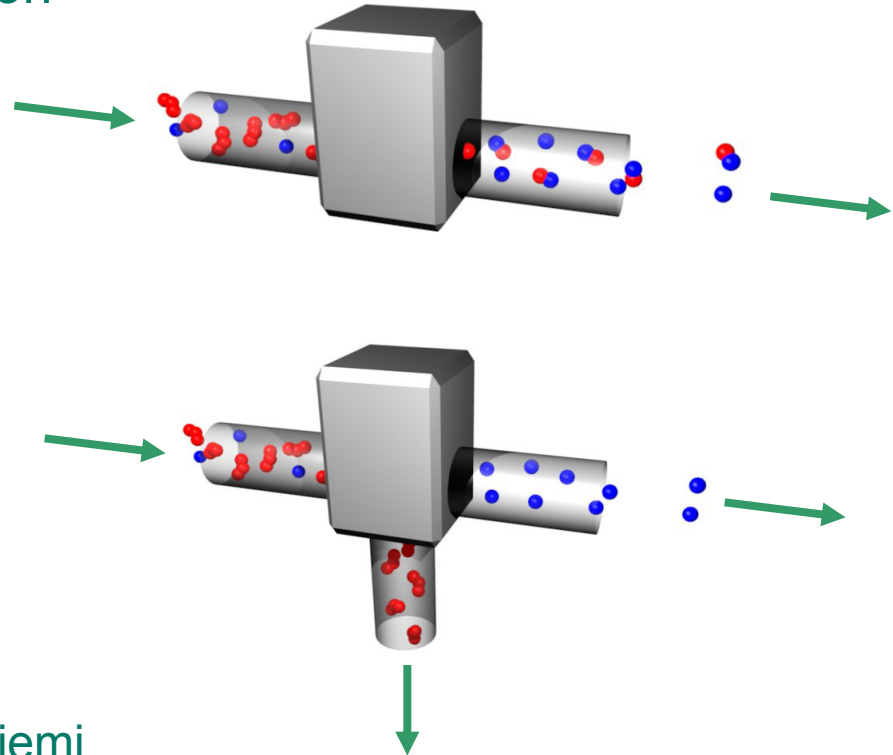
- Building downwash

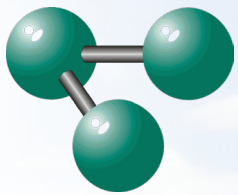




# Strategier for luktreduksjon

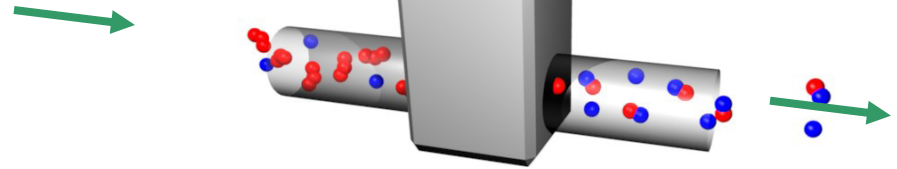
- Kjemisk Reaksjon / Oksidasjon
  - Oksidasjon
  - Dele opp
  - Lage nye stoffer
  - Mindre løselig i fett
  - Mindre lukt
- Separasjon:
  - Sorterer ut luktstoffer
  - Luktstoffene fjernes
- Unngå dannelsen av lukt
  - "Gode" råvarer ved biologi/kjemi
  - Nøytraliser lukt
  - Ventilere

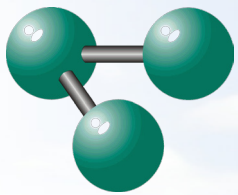




# Strategier for luktreduksjon

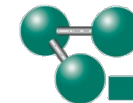
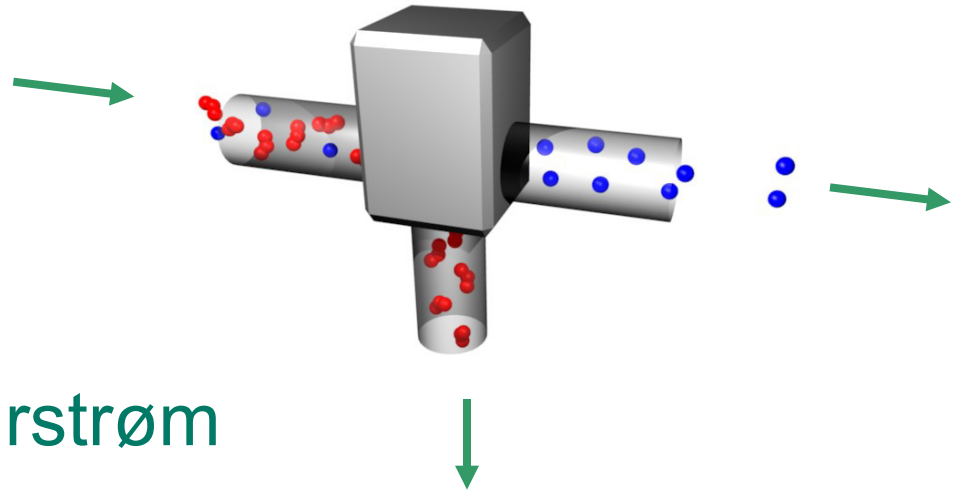
- Oksidasjon
  - Ozon
  - UV
  - Kjemisk scrubber (ozon / klor)
  - Biofilter
  - Ionisering
  - Plasma
  - Oksidasjonsfilter
  - Forbrenning / RTO
  - Bioscrubber

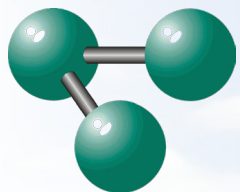




# Strategier for luktreduksjon

- Separasjon:
  - Scrubber
  - Kullfilter
  - Bobletårn / returstrøm
  - (Partikkelfilter)





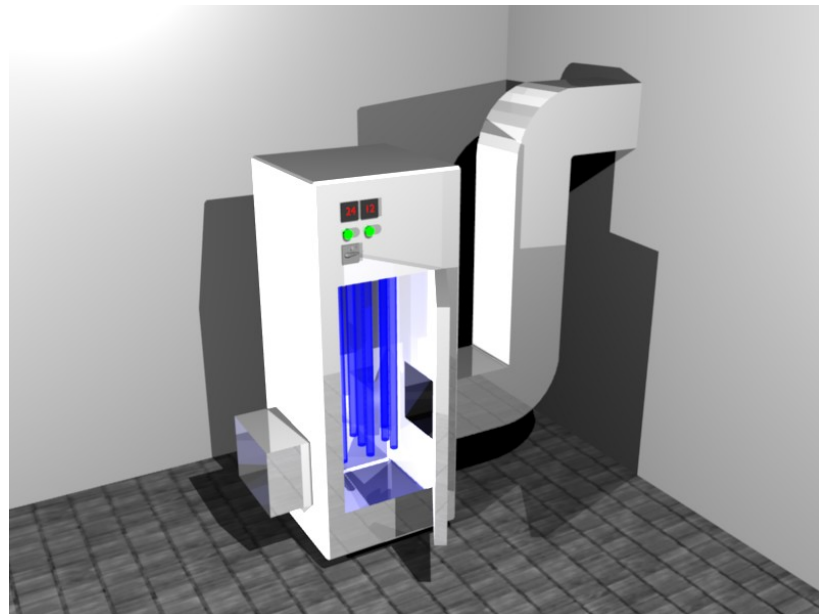
# MT-Photox

- Svært driftssikker
  - Lite vedlikehold
  - Plassbesparende
  - Renere ventilasjonskanaler
  - Bakteriefloeraen reduseres
- Fotolyse (UV)
  - Oksidasjon (Ozon)
  - Oksidasjon (Singlet oksygen)
  - Radikaler Kjedereaksjoner

$\text{H}_2\text{S}$ ,  $\text{NH}_3$ , VOC



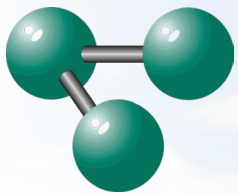
$\text{N}_2$ ,  $\text{CO}_2$ ,  $\text{H}_2\text{O}$ ,  $\text{SO}_2$



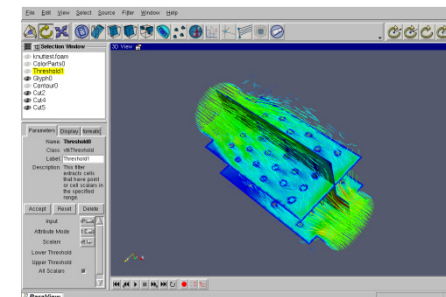
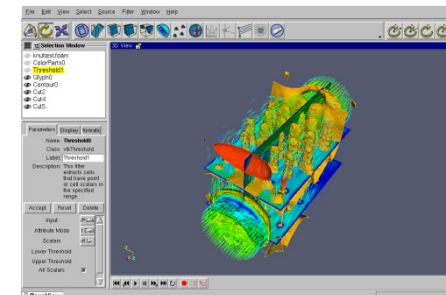
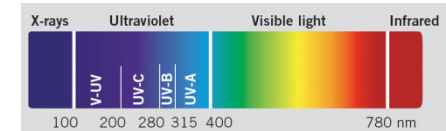
**Miljø-Teknologi AS**

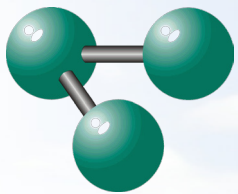
[www.mtgruppen.no](http://www.mtgruppen.no)



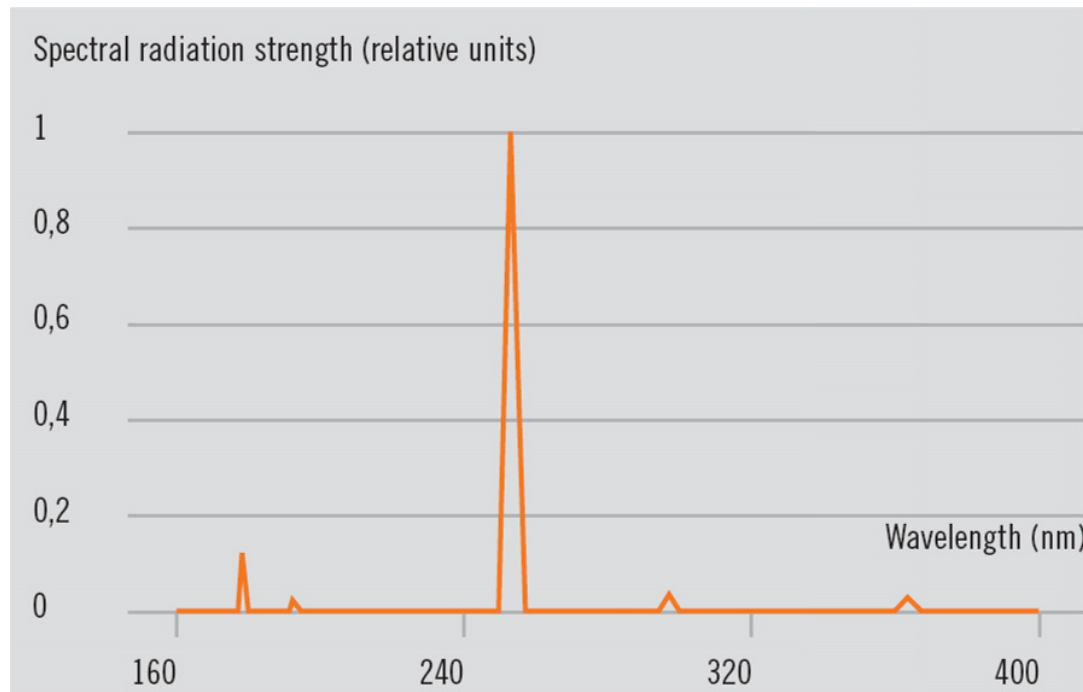
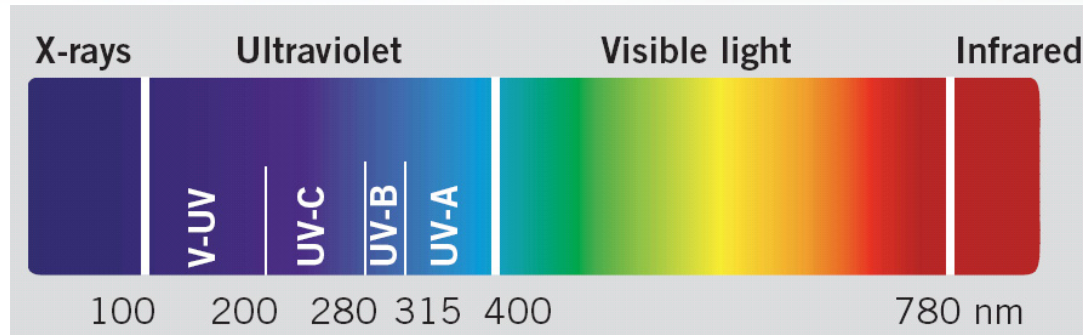


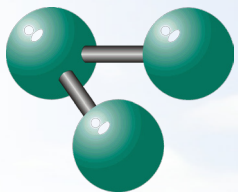
# MT-Photox





# MT-Photox

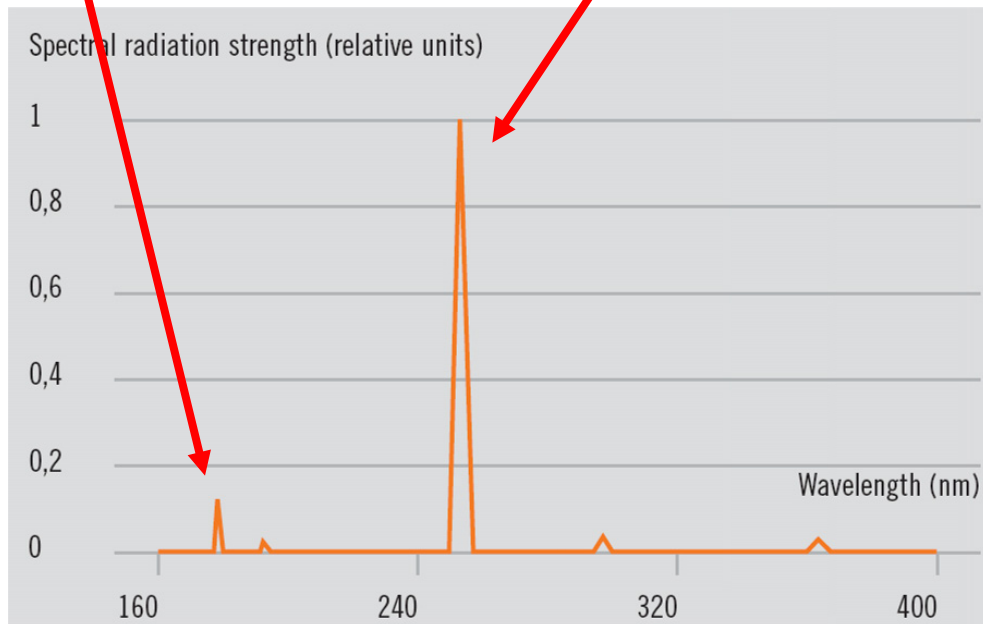




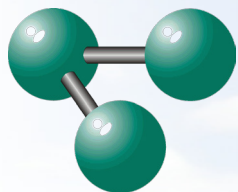
# MT-Photox

Produksjon av ozon

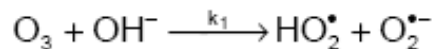
Nedbryting av ozon



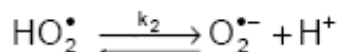
**Miljø-Teknologi AS**  
[www.mtgruppen.no](http://www.mtgruppen.no)



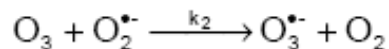
# MT-Photox



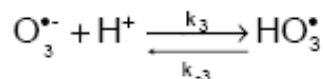
$k_1 = 70 \text{ M}^{-1} \cdot \text{s}^{-1}$  ( $\text{HO}_2^\bullet$ : hydroperoxide radical)



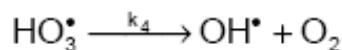
$k_2$  (ionization ct) =  $10^{-4.8}$  ( $\text{O}_2^{\bullet-}$ : superoxide radical ion)



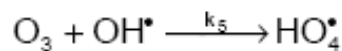
$k_2 = 1.6 \times 10^9 \text{ M}^{-1} \cdot \text{s}^{-1}$  ( $\text{O}_3^{\bullet-}$ : ozonide radical ion)



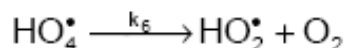
$k_3 = 5.2 \times 10^{10} \text{ M}^{-1} \cdot \text{s}^{-1}$ ;  $k_{-3} = 2.3 \times 10^2 \text{ s}^{-1}$ ;  $\text{pK}_a = 6.2$



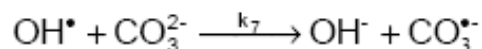
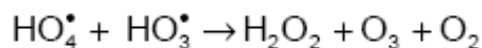
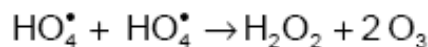
$k_4 = 1.1 \times 10^5 \text{ s}^{-1}$



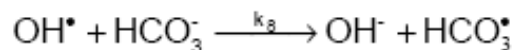
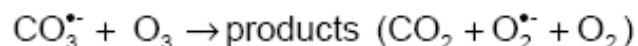
$k_5 = 2.0 \times 10^9 \text{ M}^{-1} \cdot \text{s}^{-1}$



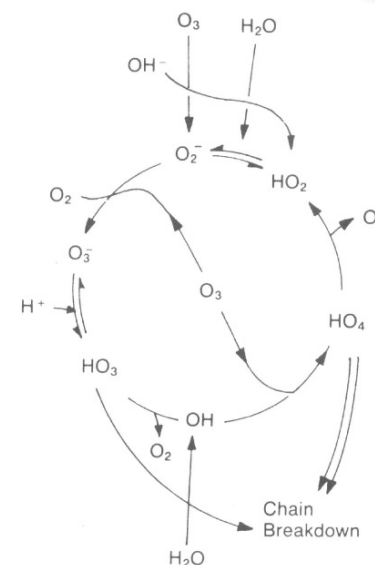
$k_6 = 2.8 \times 10^4 \text{ s}^{-1}$



$k_7 = 4.2 \times 10^8 \text{ M}^{-1} \cdot \text{s}^{-1}$



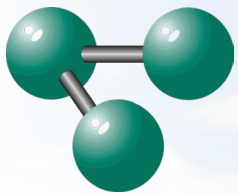
$k_8 = 1.5 \times 10^7 \text{ M}^{-1} \cdot \text{s}^{-1}$



**Miljø-Teknologi AS**

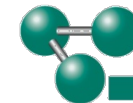
[www.mtgruppen.no](http://www.mtgruppen.no)



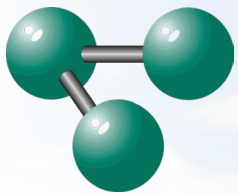


# MT-Carbon/kullfilter

- Effektiv: **99.9%** luktreduksjon
- Enkel – lite vedlikehold

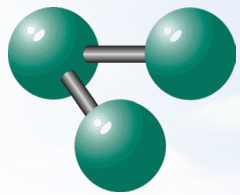






# Hva er aktivt kull?

- Er et høyporøst kull med svært stor indre overflate
  - 1g aktivt kull har overflate på ca 1000m<sup>2</sup>
- Aktivt kull fungerer ved at fremmede stoffer fester seg til overflaten av kullet
- Det kan produseres aktivt kull av alle materiale som benyttes til kull.



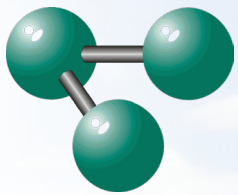
# KP 523 Falkumlia, Skien



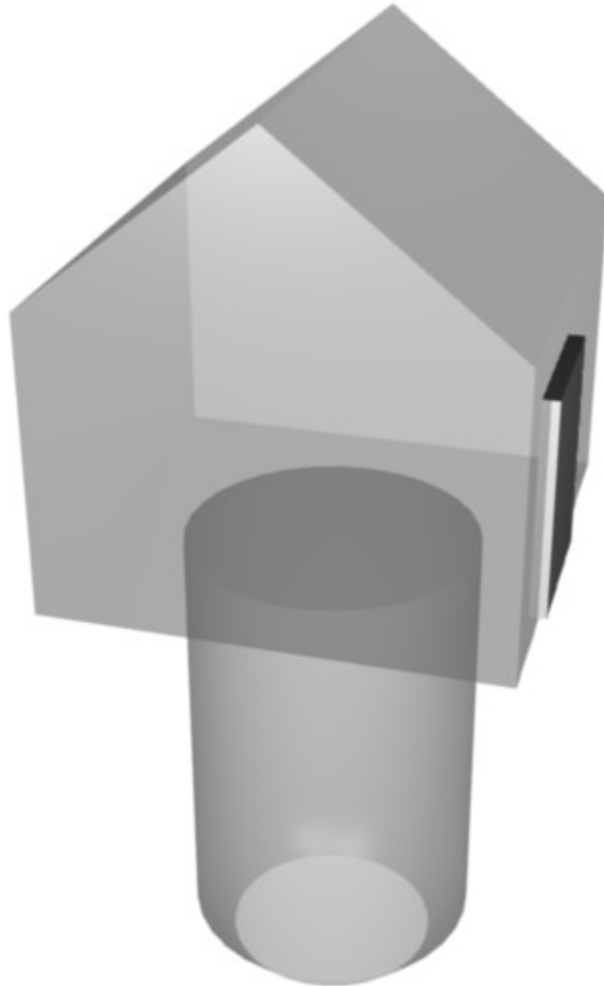
***MT-CARBON***



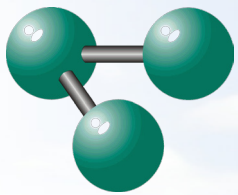
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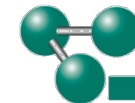
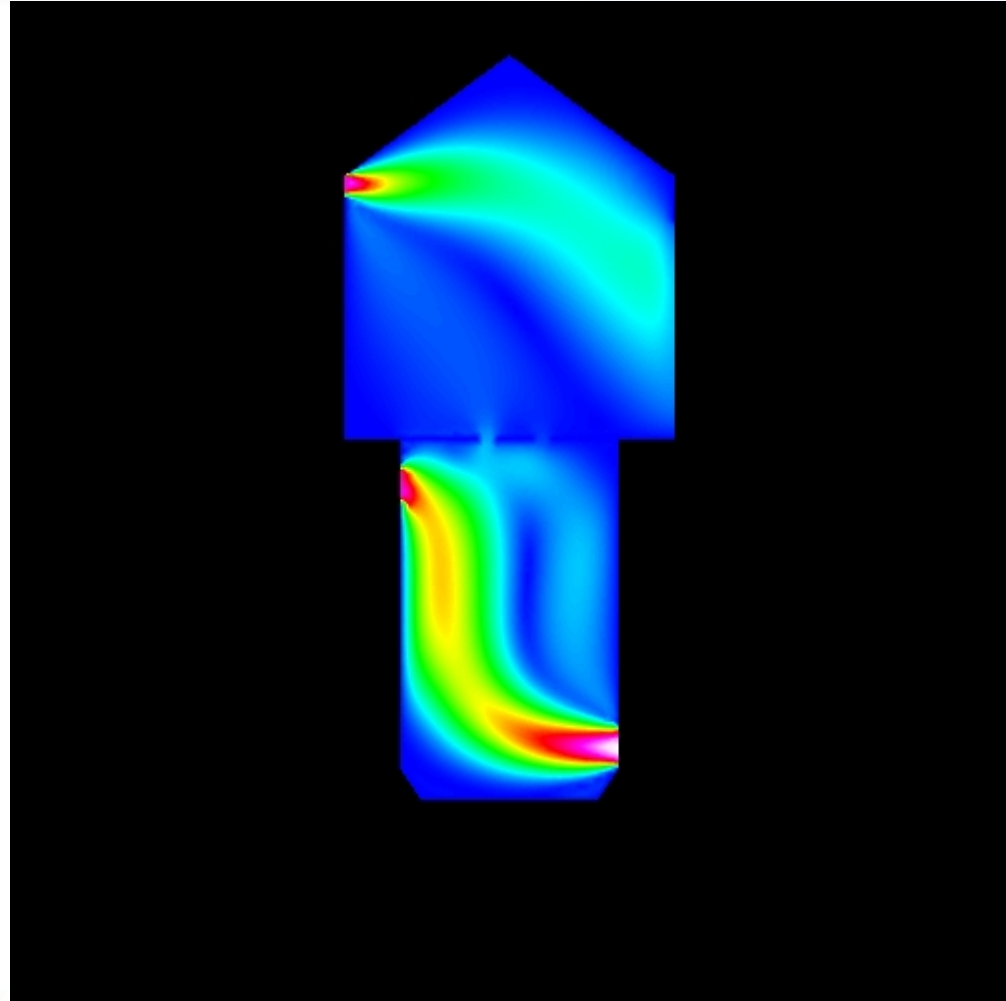
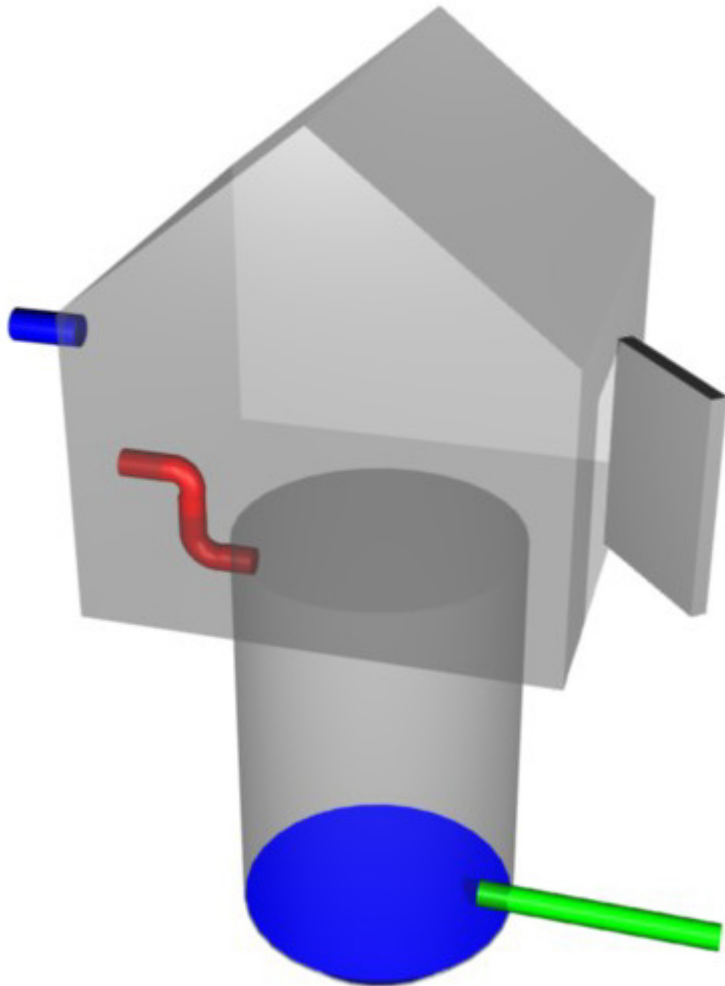
# Ventilasjons-strategi

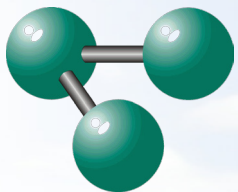


- Hensikt
  - Gi godt arbeidsmiljø
  - Hindre korrosjon
  - Skille ren og uren sone



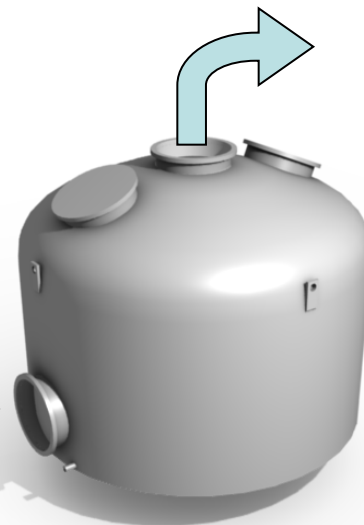
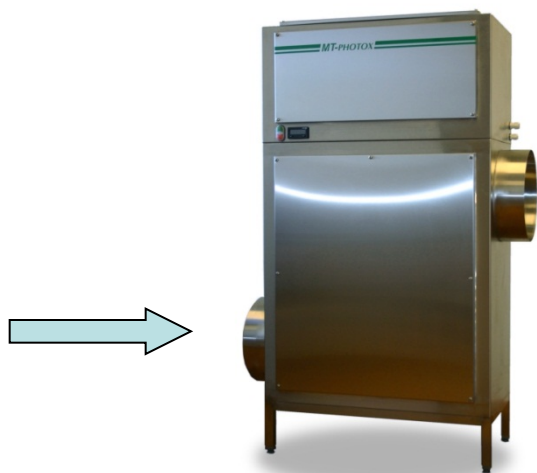
# Ventilasjons-strategi: Balanse





# MT-Photox process

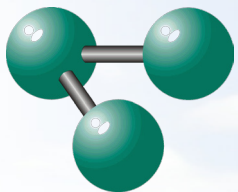
Reactor



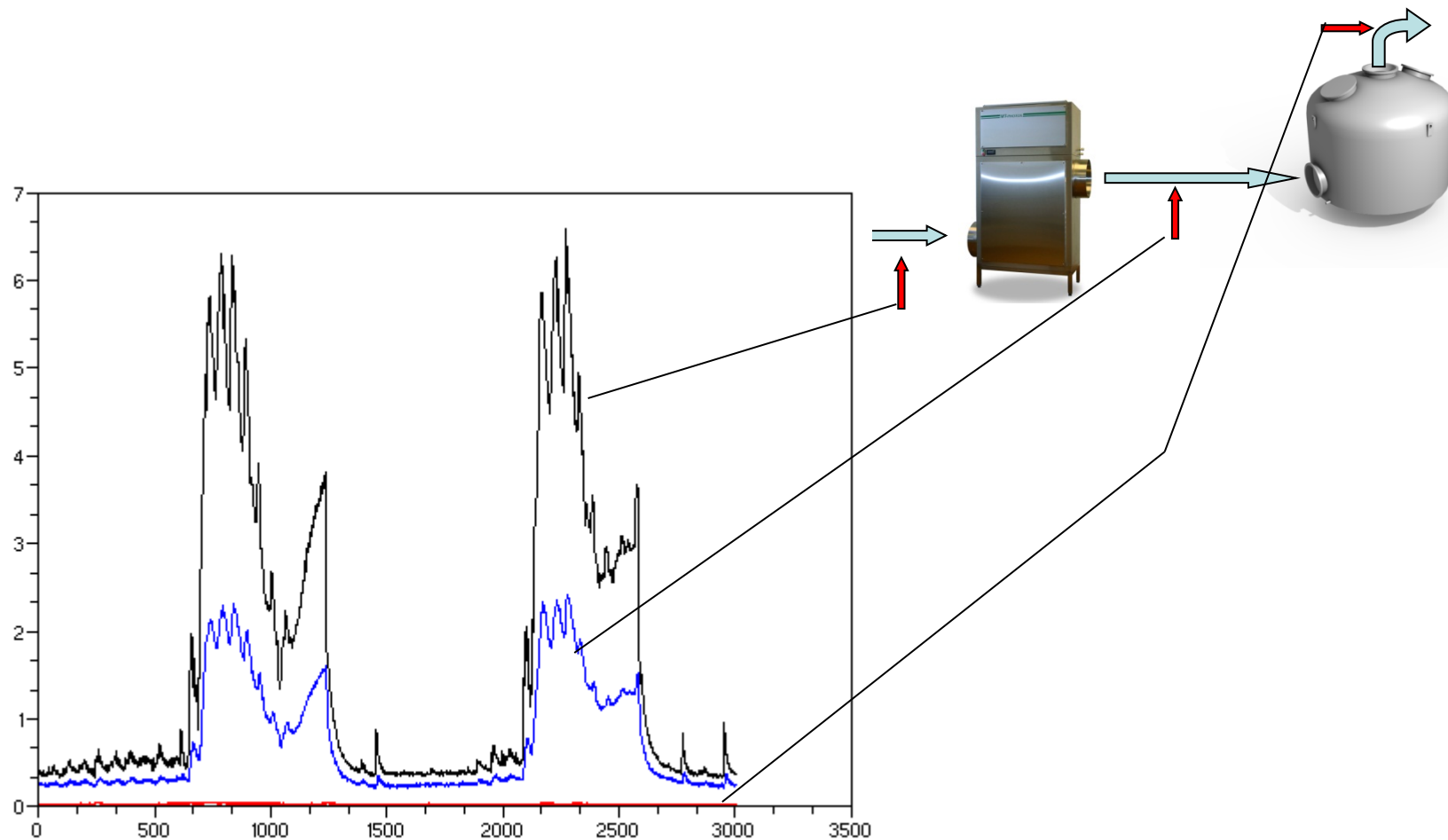
Catalyst

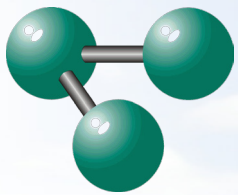




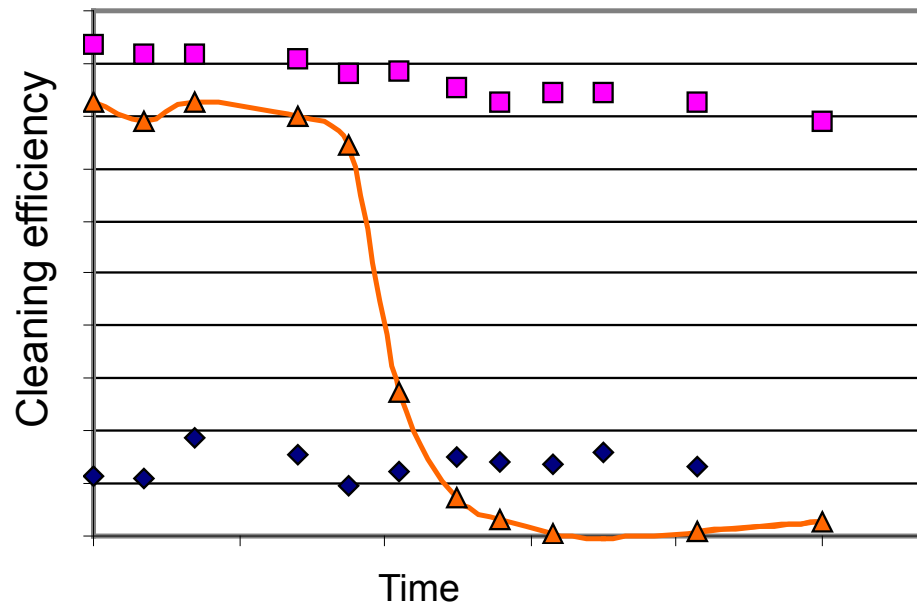
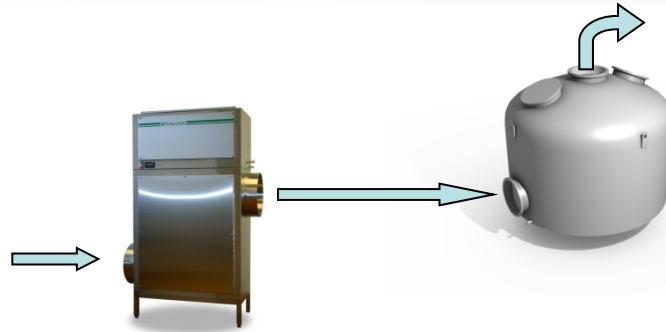


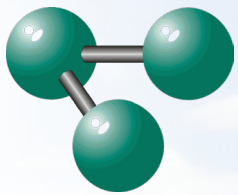
# MT-Photox process



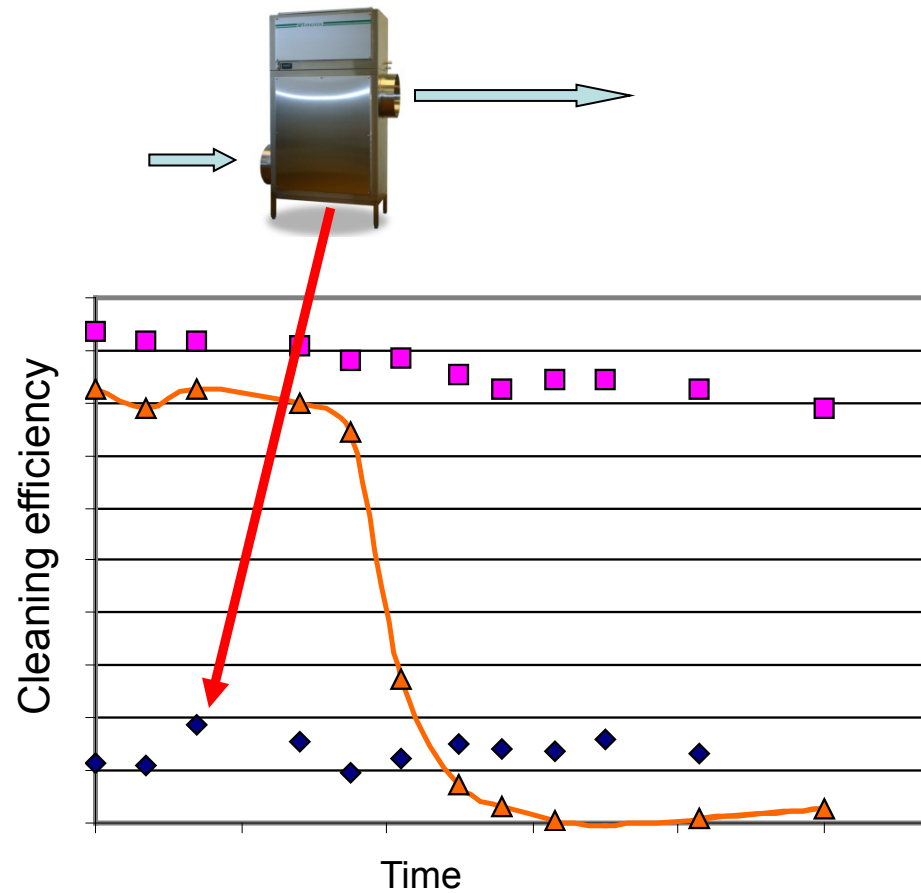


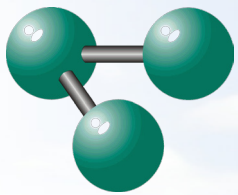
# MT-Photox process



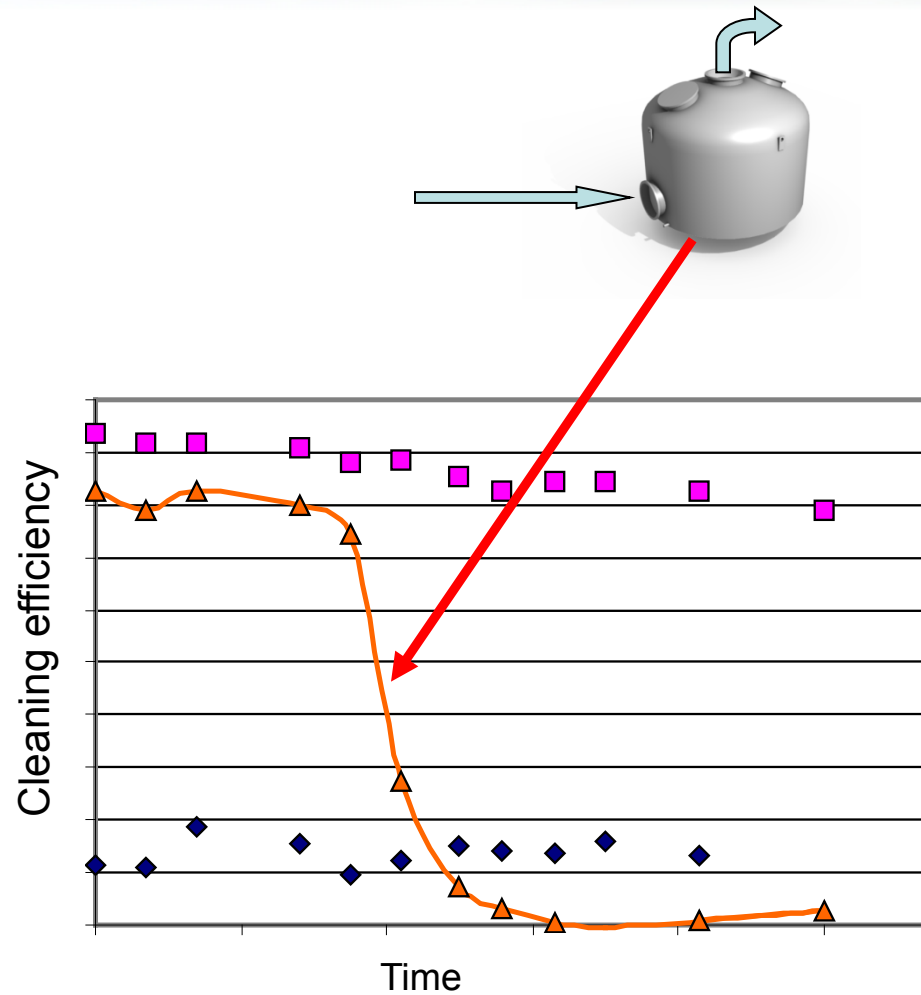


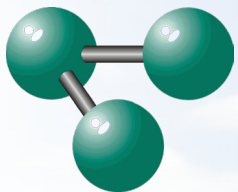
# MT-Photox process



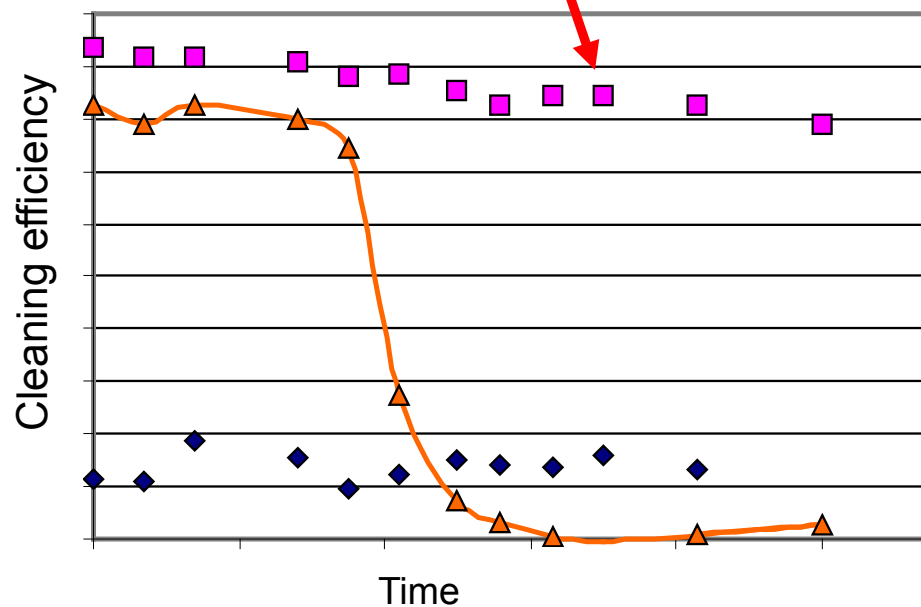
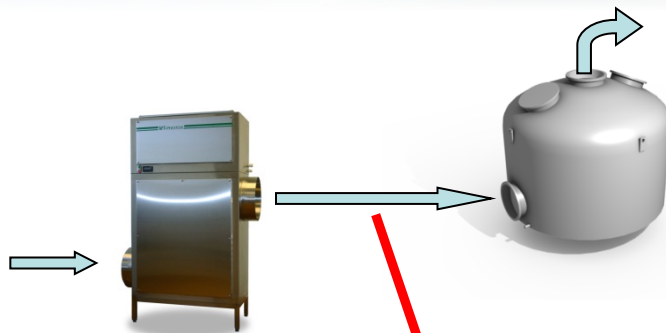


# MT-Photox process

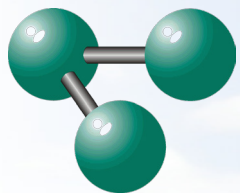




# MT-Photox process

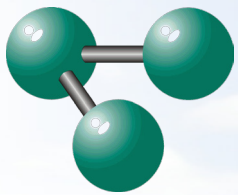




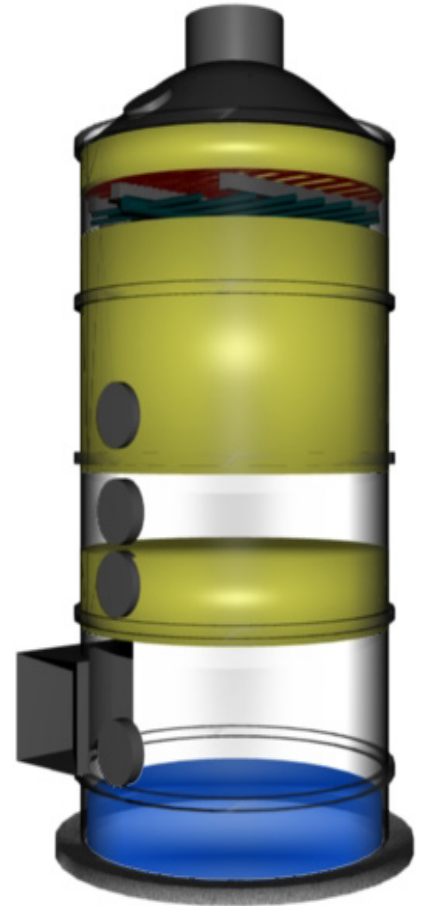
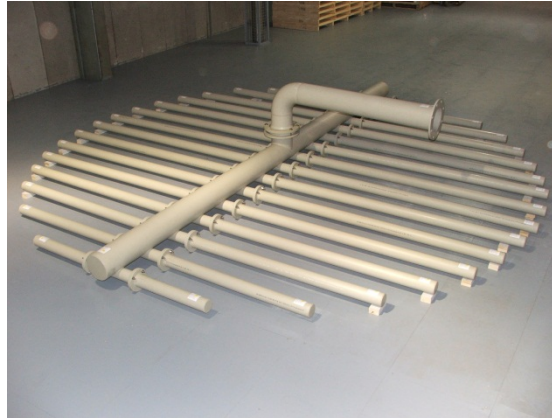
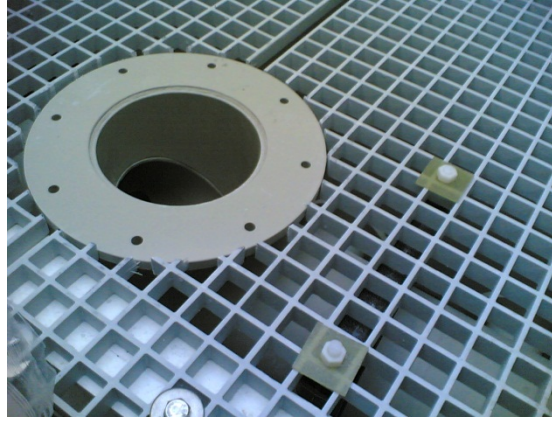
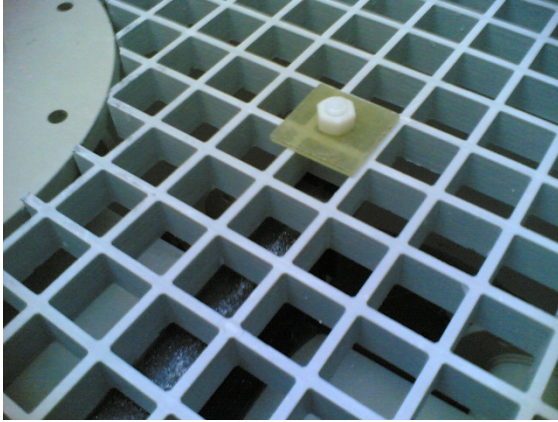


# MT-Scrubber

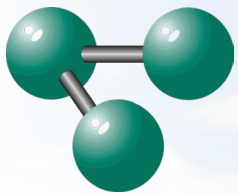




# MT-Seascrubber

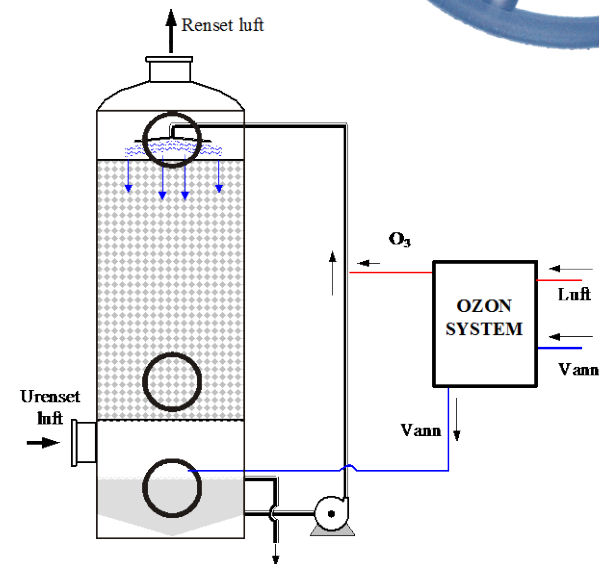
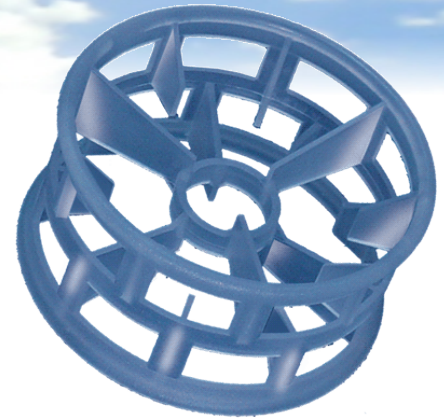


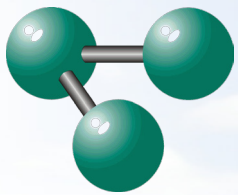




# MT-Scrubber

- Effektiv rensing av  $\text{NH}_3$ , Aminer, VFA
- Pakket eller kun spray
- Kombineres med Ozon
- Egnet for store luftmengder

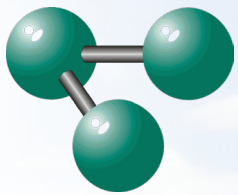




# MT-Biobed

- Mikrobiologisk prosess
- Tilpasset befuktningssystem
- Spesialtilpasset bedmateriale
  - Optimal struktur
  - Lavt trykfall
  - Buffer/alkaliekilde beskytter mot VFA
- Optimale driftsforhold
- Høy rensegrad
- Lang levetid



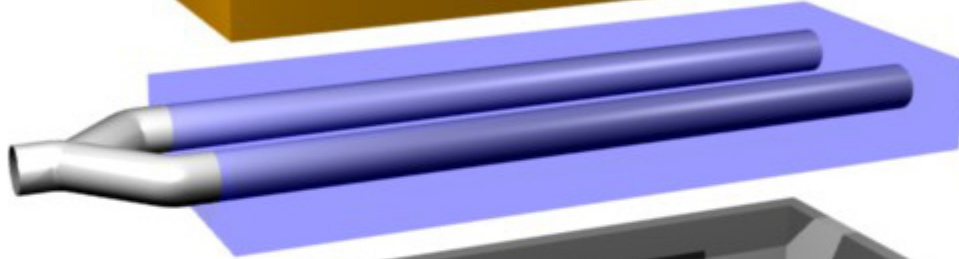


# MT-Biobed

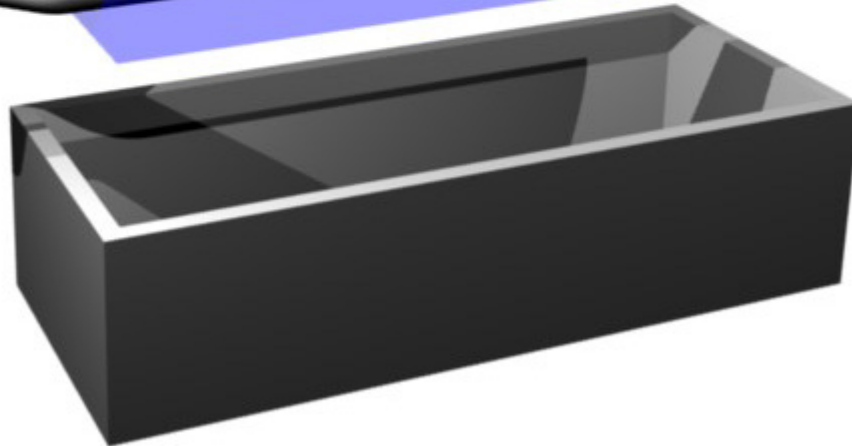
Filtermasse



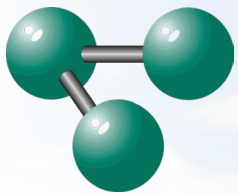
Gassfordeling



Tank





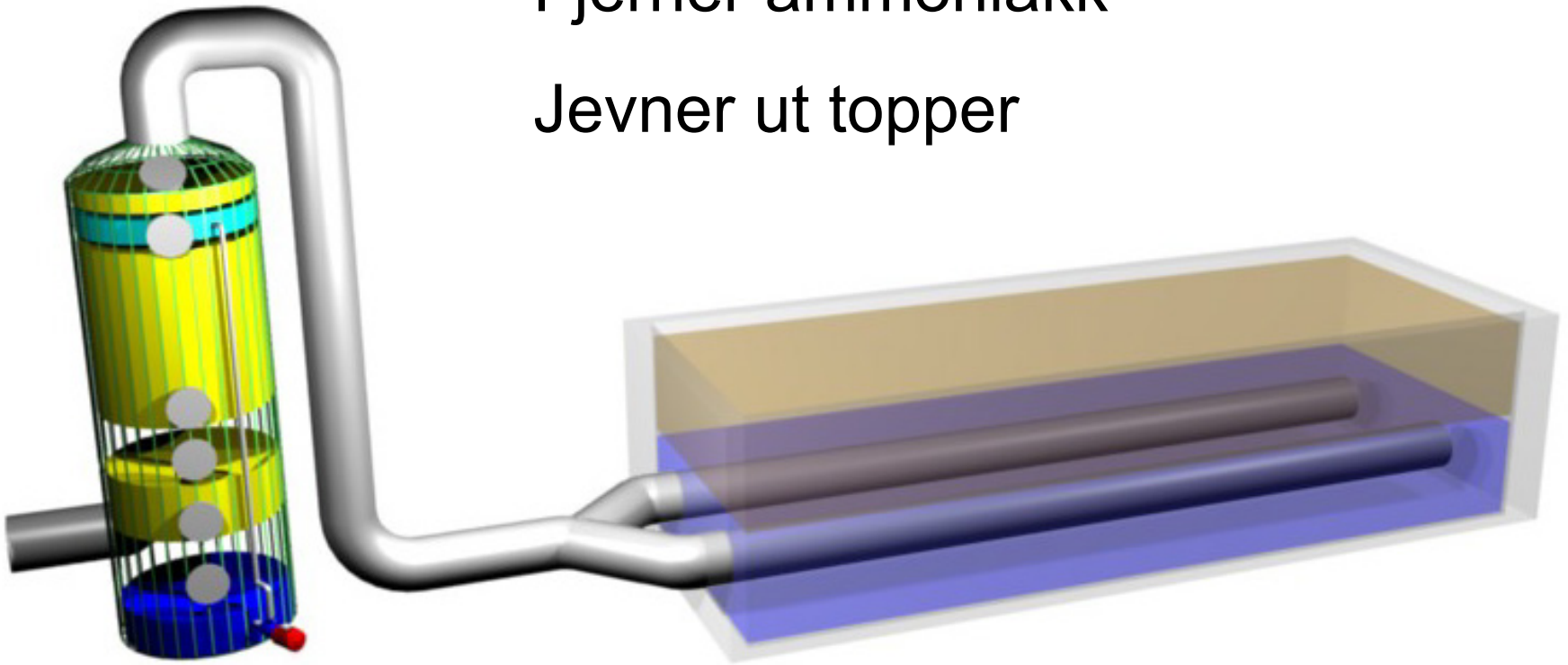


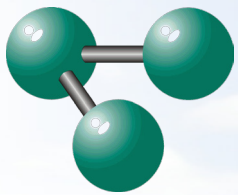
# MT-Biobed med scrubber

Fukter

Fjerner ammoniakk

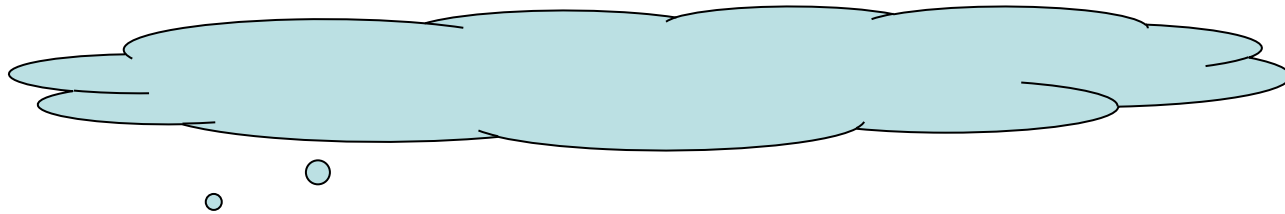
Jevner ut topper



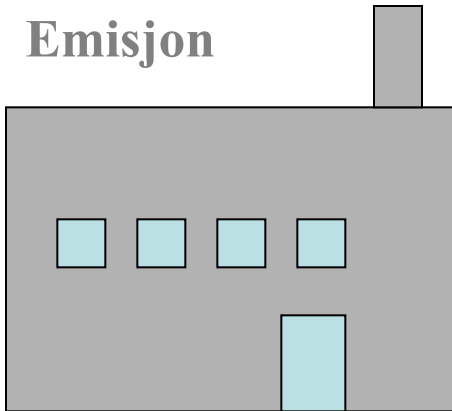


# Gjennomføring av luktmålinger

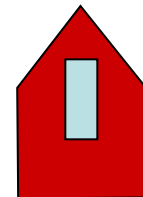
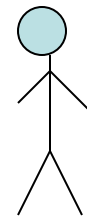
- Innsamling av luktprøver
- Luktpanel
- Luktspredning



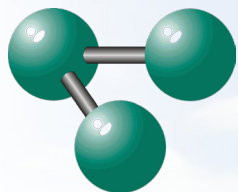
Emisjon



Immisjon



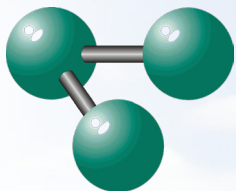
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# Eksempel på luktanalyse

## RESULTATER

| Prove merket:<br>Analysedato: 18.1.2011 |                                 | #1<br>Før<br>Photox /kull | #2<br>Etter<br>Photox/ kull | #3<br>Før<br>Klorscrubber | #4<br>Etter<br>Klorscrubber |
|-----------------------------------------|---------------------------------|---------------------------|-----------------------------|---------------------------|-----------------------------|
| Parameter                               | Enhet                           | KA-052247                 | KA-052248                   | KA-052249                 | KA-052250                   |
| luktkons. i dB                          | $\text{dB}_{\text{ouE}}$        | $46,0 \pm 1,6$            | $21,3 \pm 1,2$              | $51,0 \pm 2,2$            | $51,3 \pm 2,6$              |
| luktkonsentrasjon                       | $\text{ou}_\text{E}/\text{m}^3$ | 40 000                    | 140                         | 130 000                   | 130 000                     |
| luktkons. 95%-<br>intervall             | $\text{ou}_\text{E}/\text{m}^3$ | 28 000 – 57 000           | 100 – 180                   | 77 000 – 210 000          | 73 000 – 250 000            |



For ytterligere informasjon:

[www.mtgruppen.no](http://www.mtgruppen.no)

Takk for oppmerksomheten!