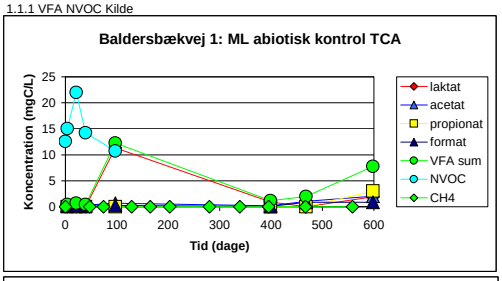
Nedbrydning af 1,1,1-TCA ved stimuleret reduktiv dechlorering

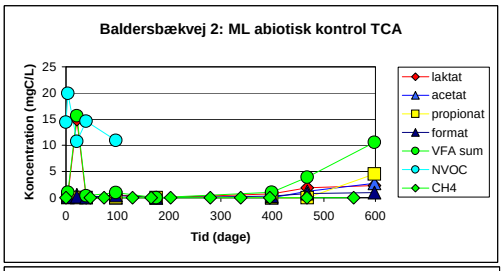
Treatability-forsøg for lokaliteterne Baldersbækvej, Høje Taastrup Vej og Vasbyvej.

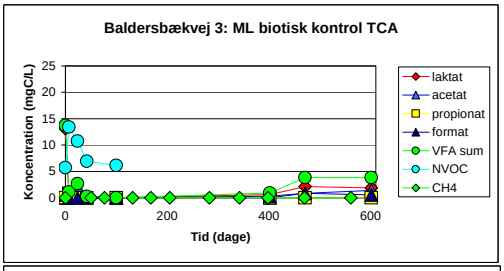
Bilag til
Statusnotat
April 2010

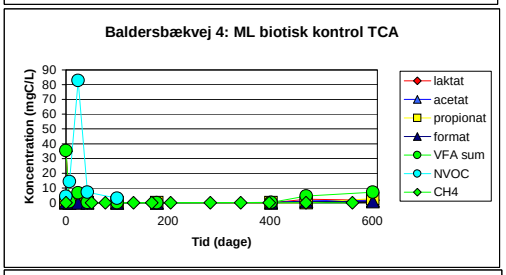
Mette M. Broholm og Charlotte Scheutz
DTU Miljø

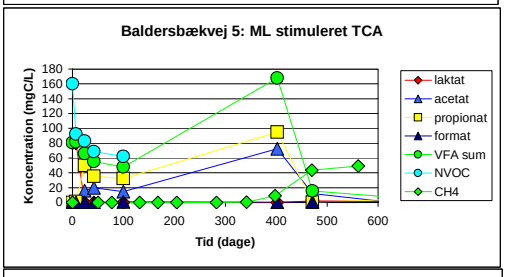
1.1 Baldersbækvej Donor
1.1.1 VFA NVOC Kilde

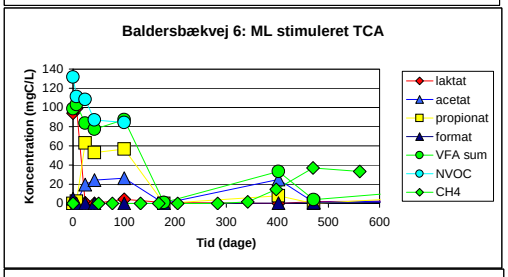


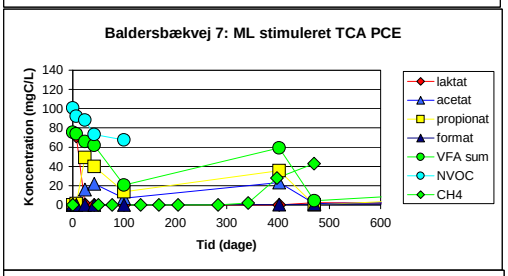


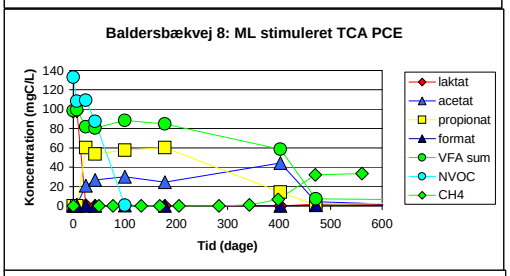


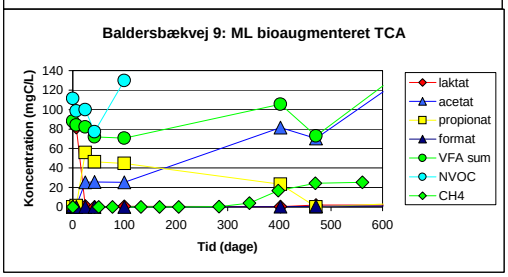


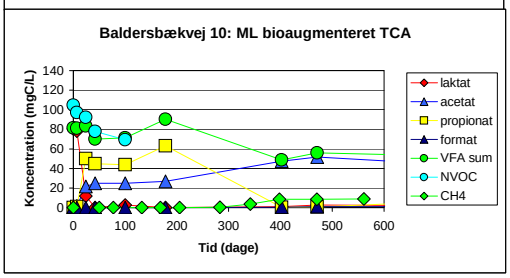


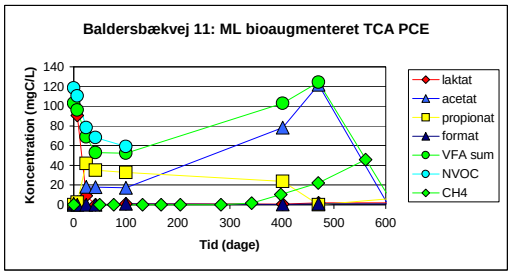


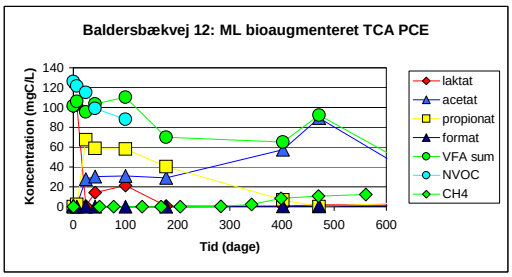


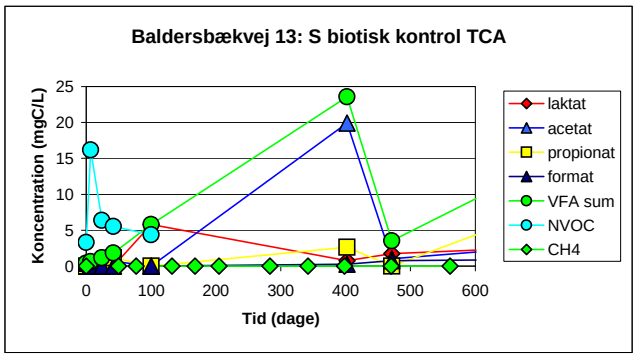


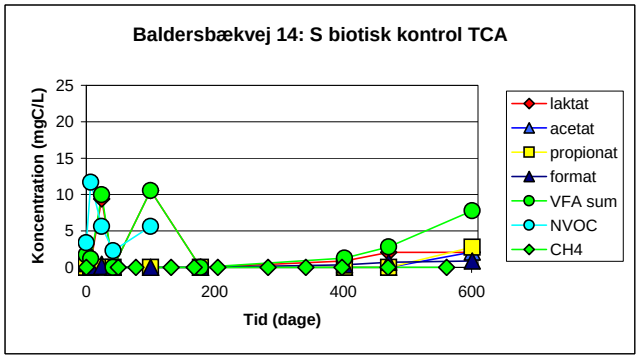




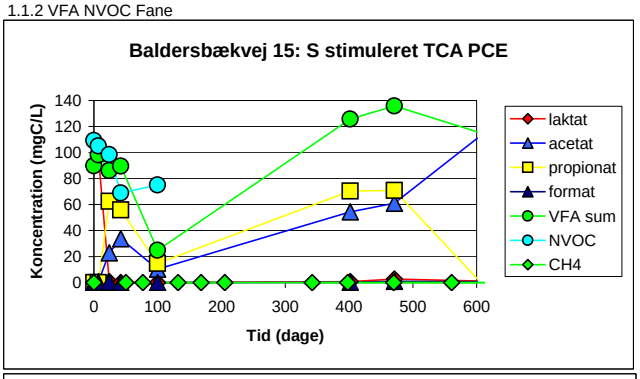


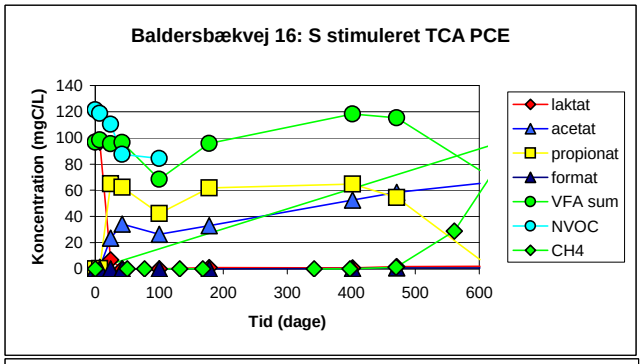


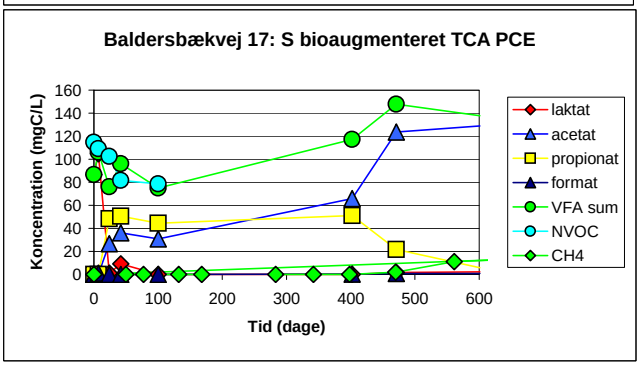


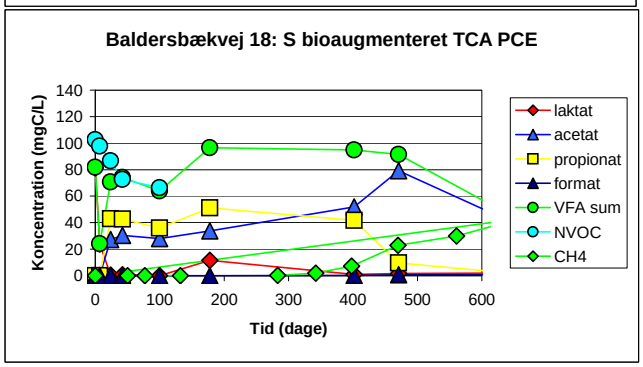


1.1 Baldersbækvej Donor
1.1.2 VFA NVOC Fane

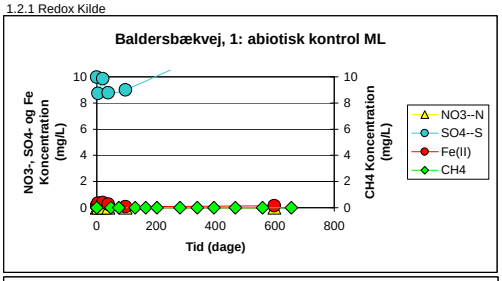


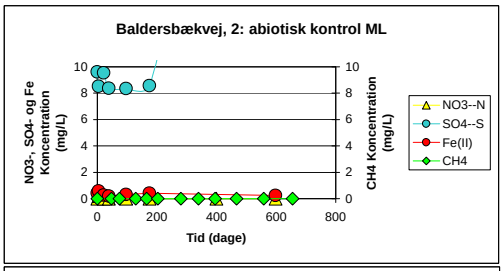


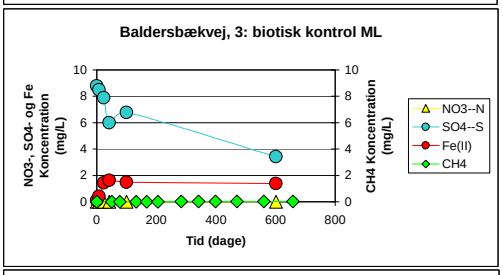


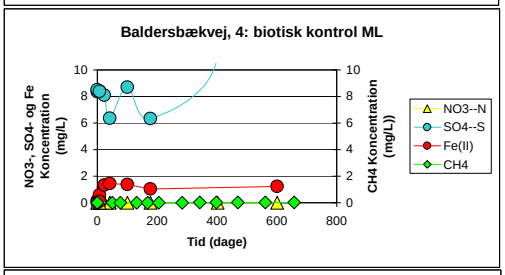


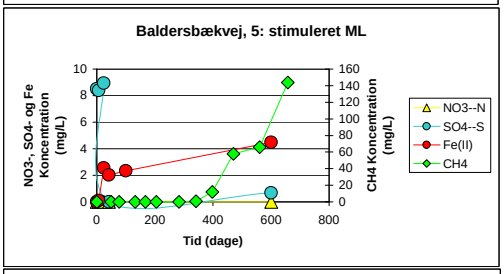
1.2 Baldersbækvej Redox
1.2.1 Redox Kilde

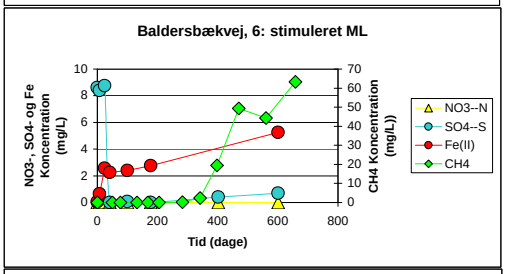


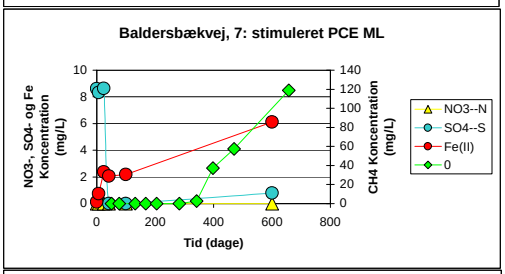


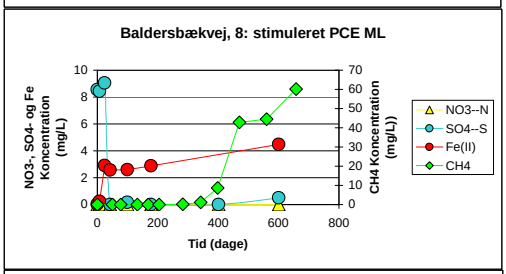


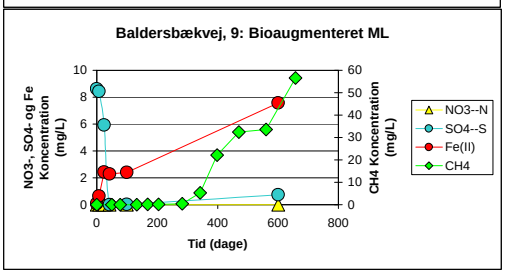


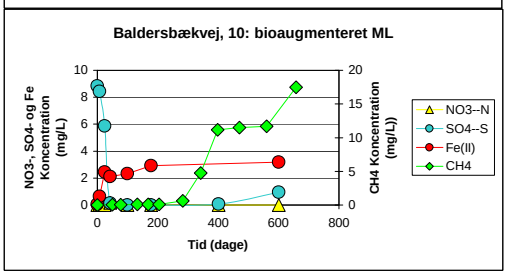


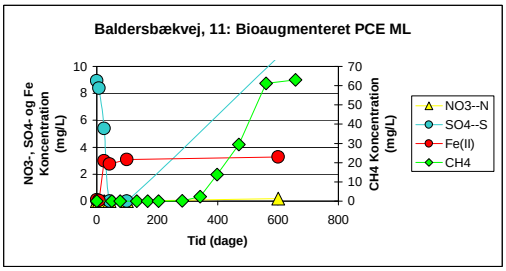


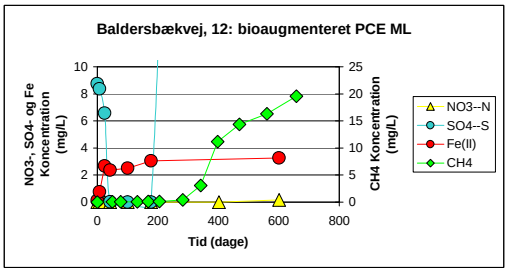




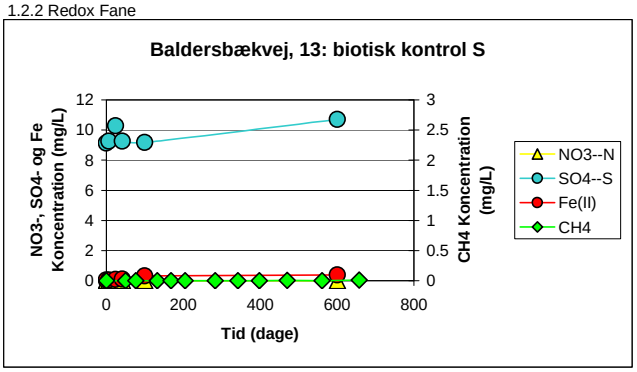


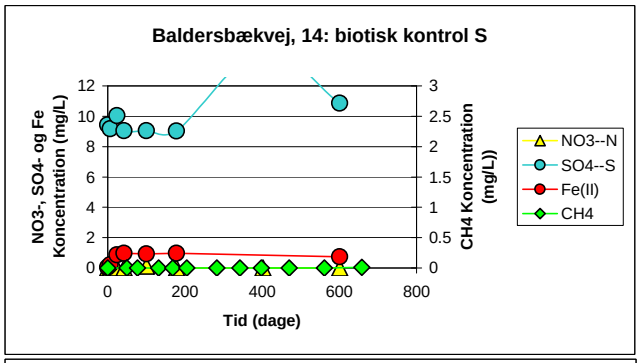


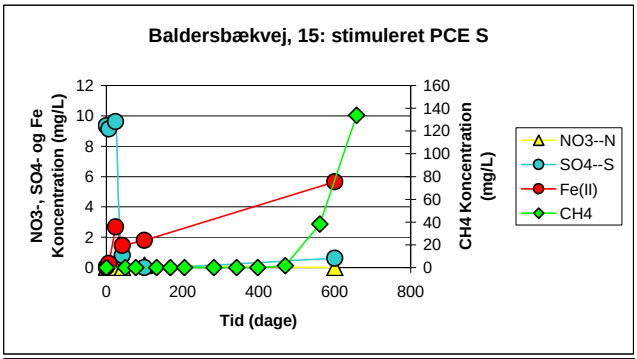


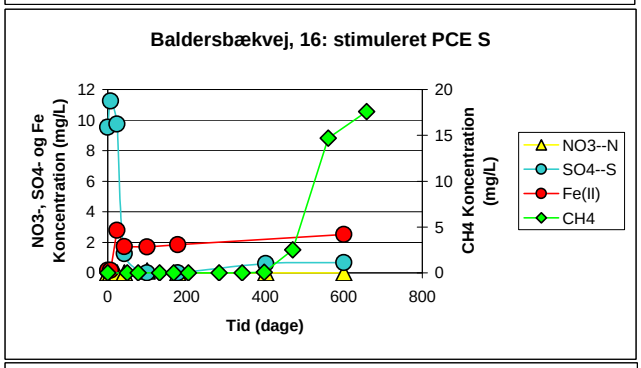


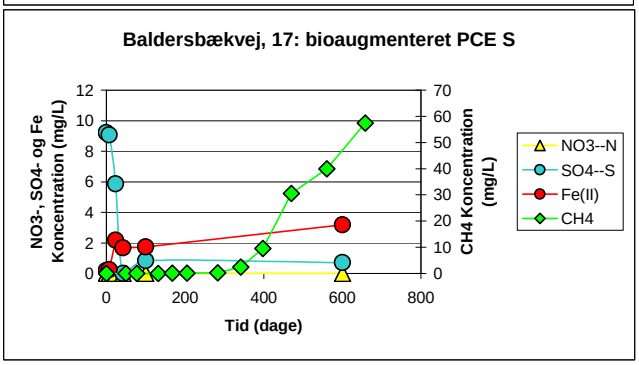
1.2 Baldersbækvej Redox
1.2.2 Redox Fane

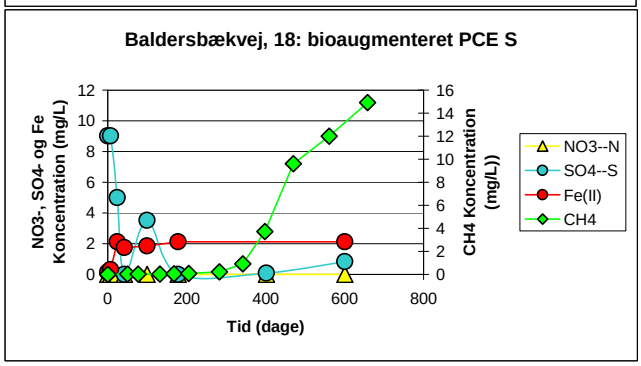






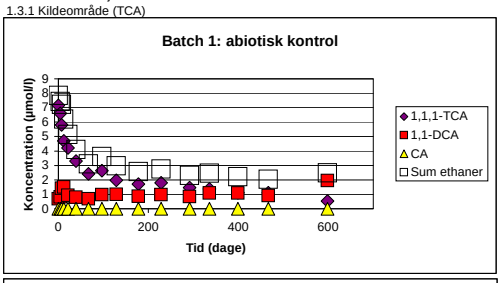


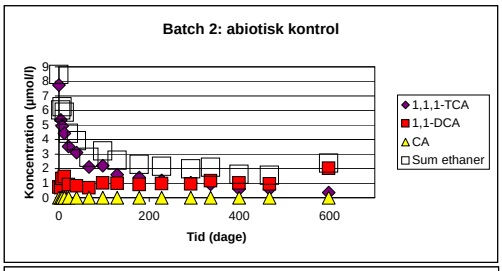


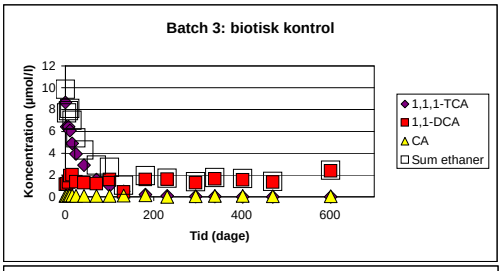


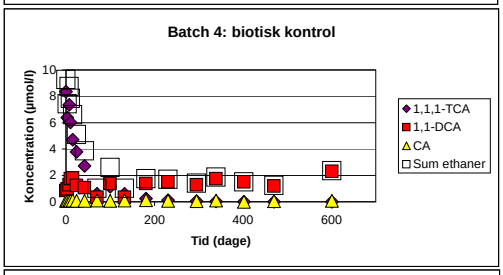
1.3 Baldersbækvej Chlorerede ethaner

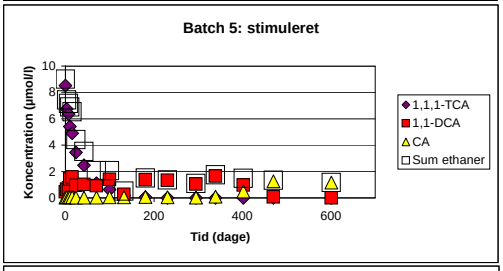
1.3.1 Kildeområde (TCA)

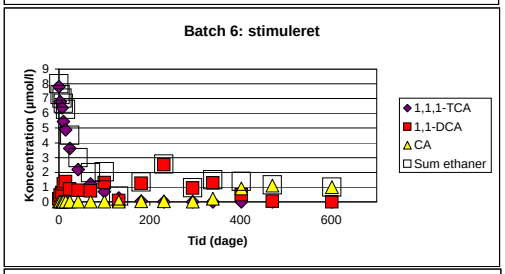


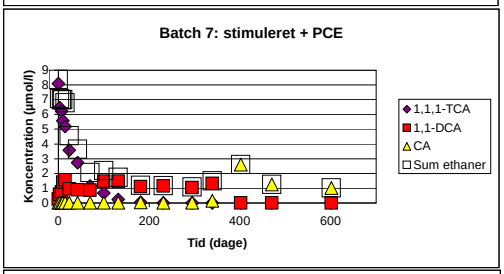


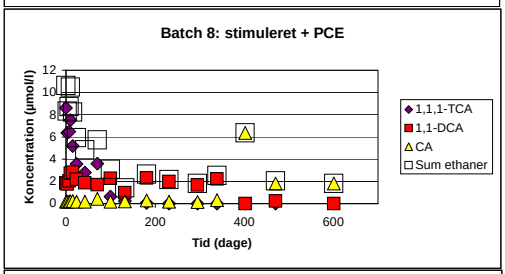


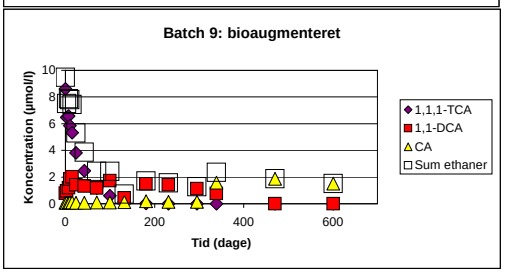


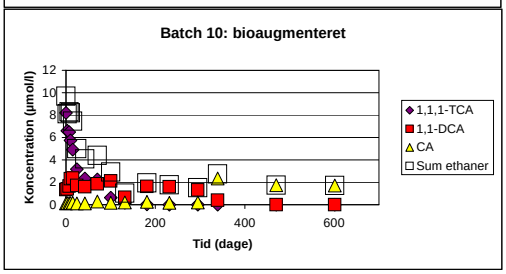


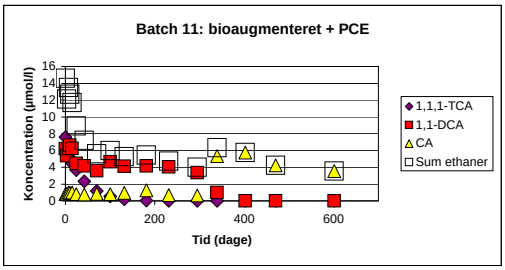


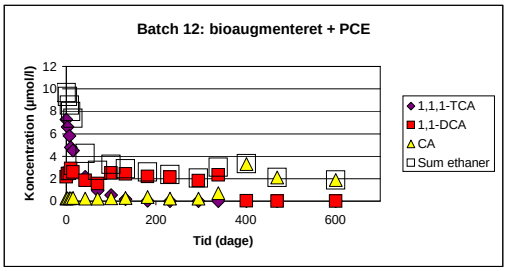




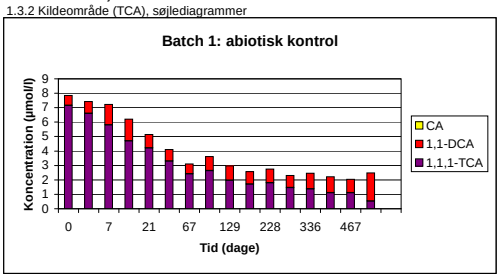


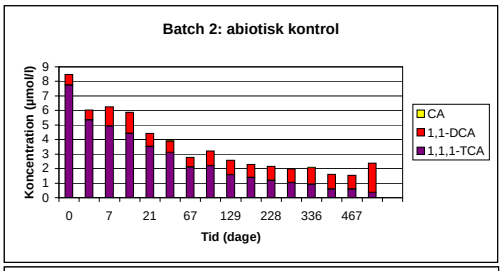


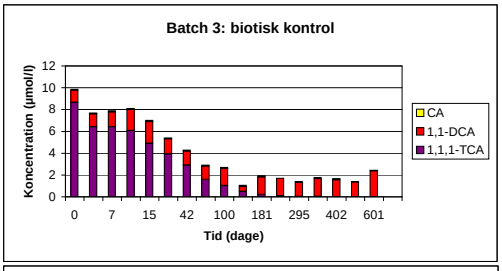


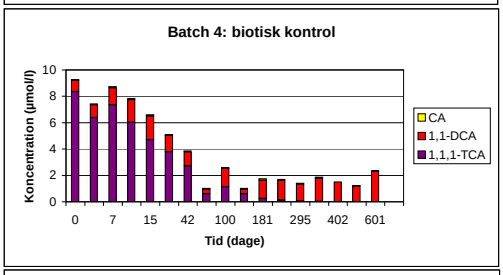


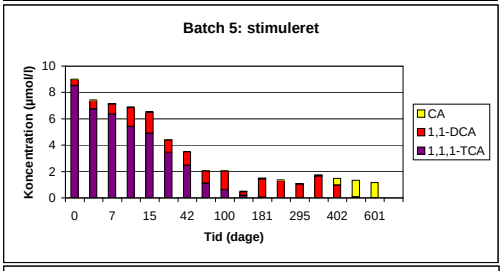
1.3 Baldersbækvej Chlorerede ethaner
1.3.2 Kildeområde (TCA), søjlediagrammer

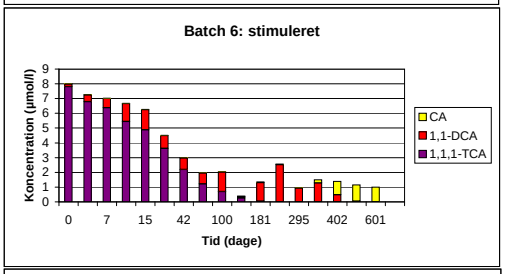


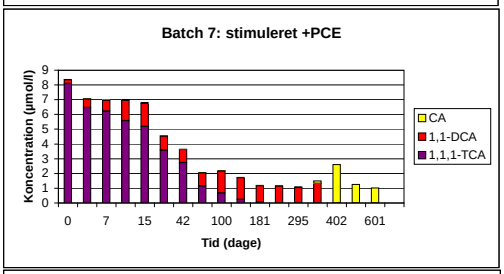


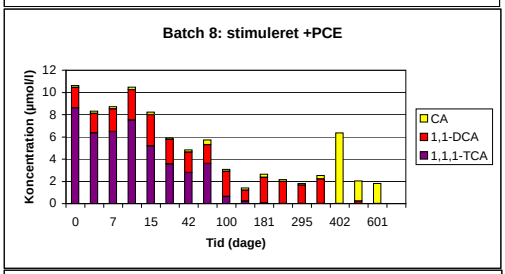


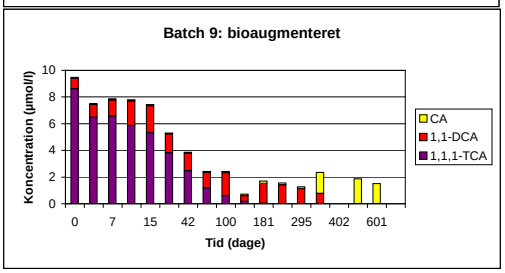


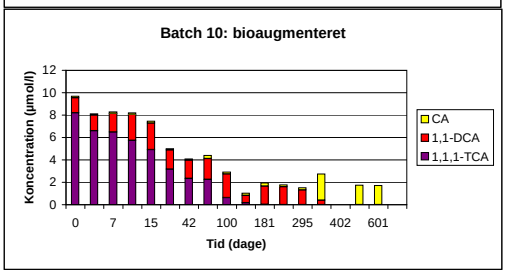


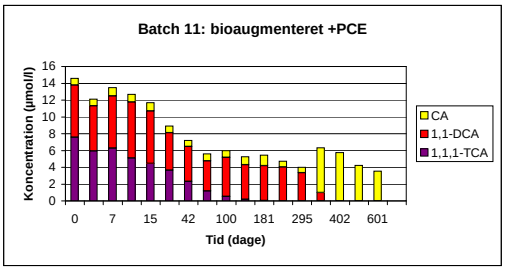


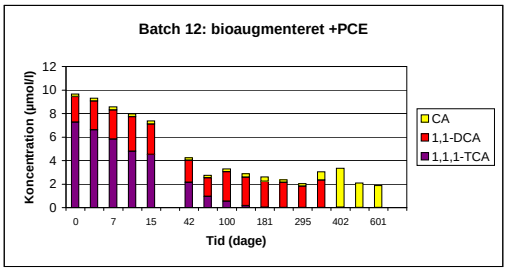




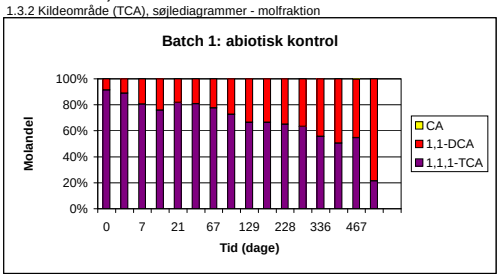


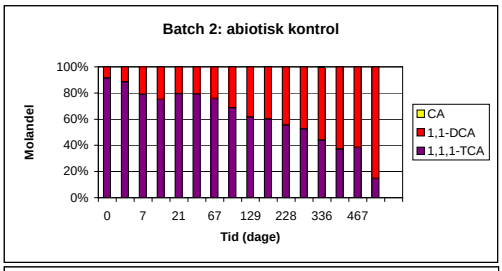


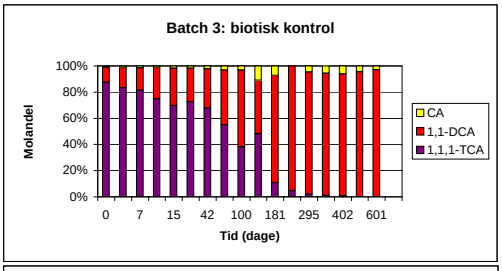


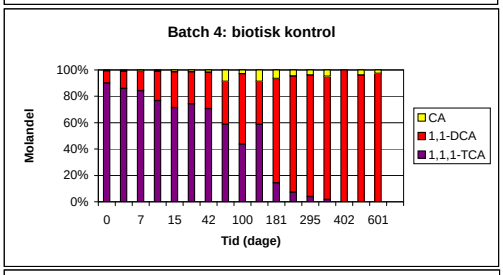


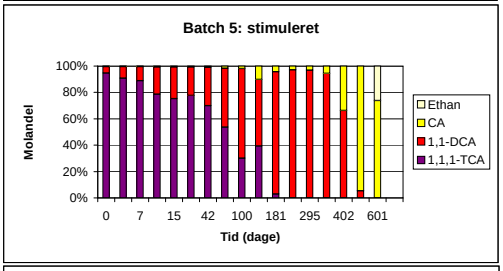
1.3 Baldersbækvej Chlorerede ethaner
1.3.2 Kildeområde (TCA), søjlediagrammer - molfraktion

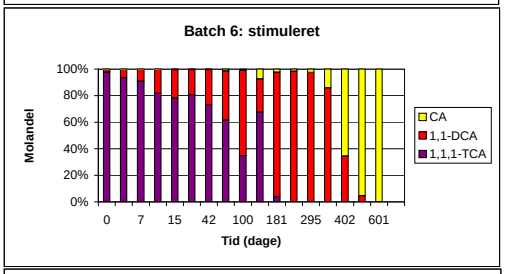


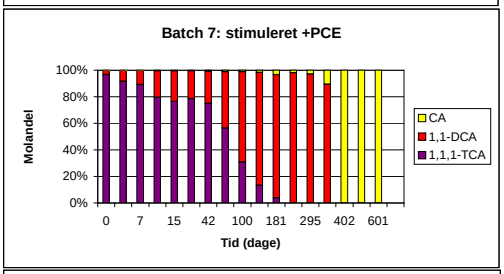


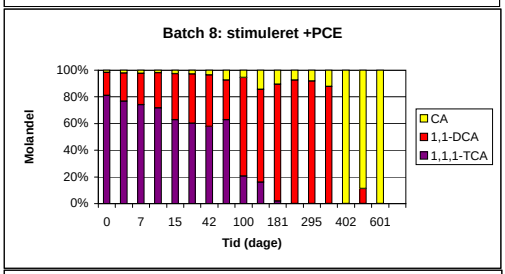


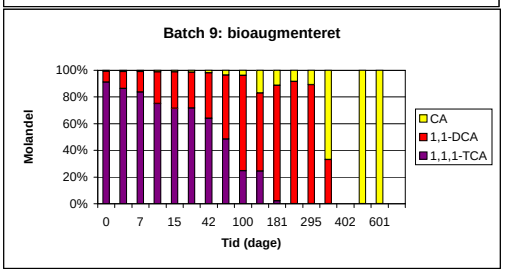


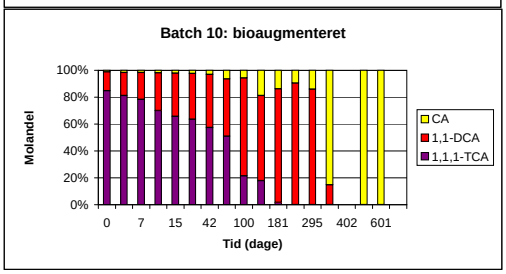


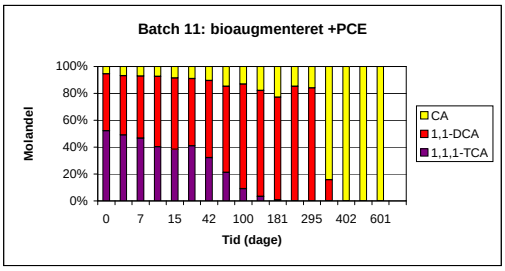


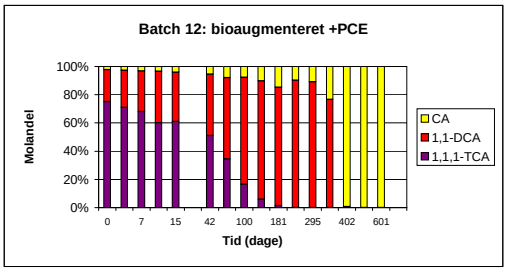






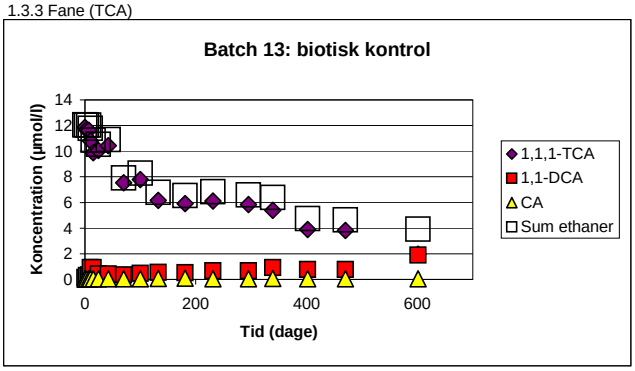


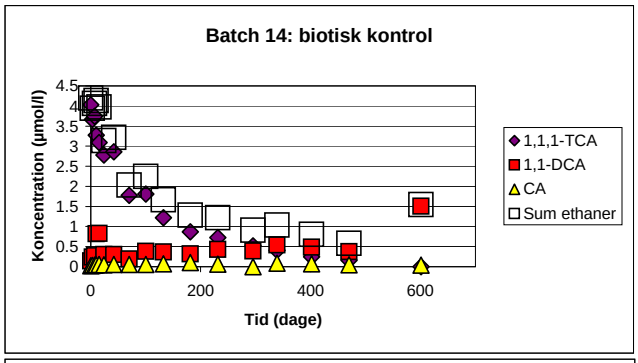


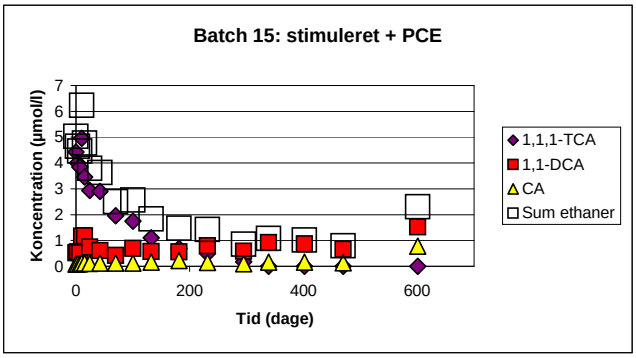


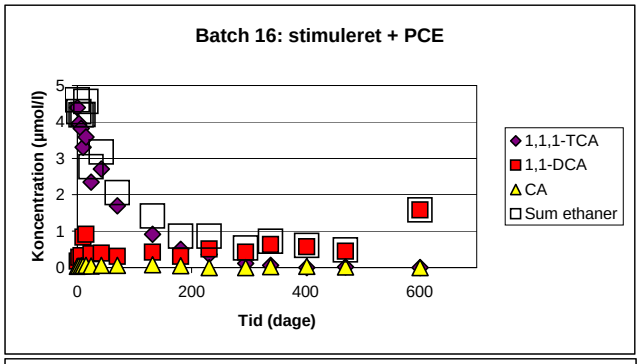
1.3 Balderbækvej Chlorerede ethaner

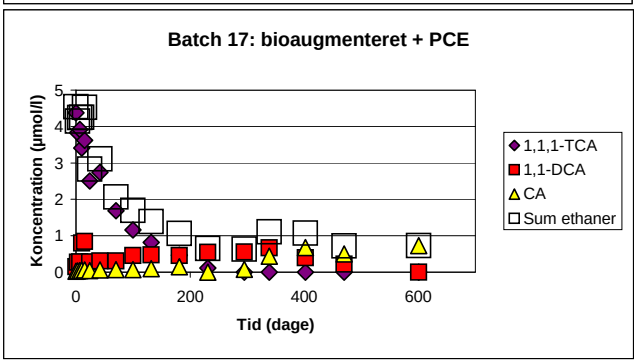
1.3.3 Fane (TCA)

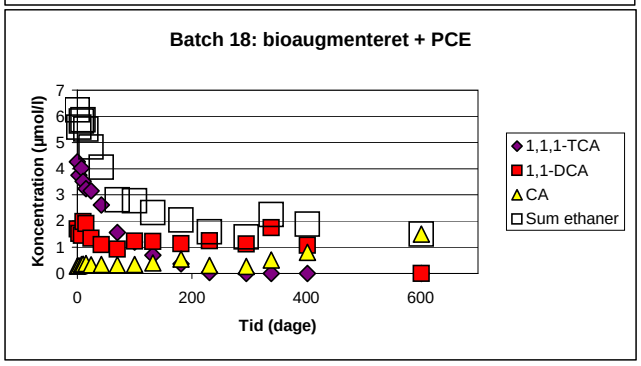




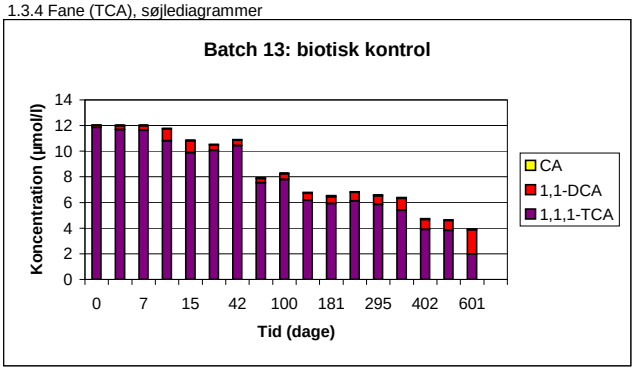


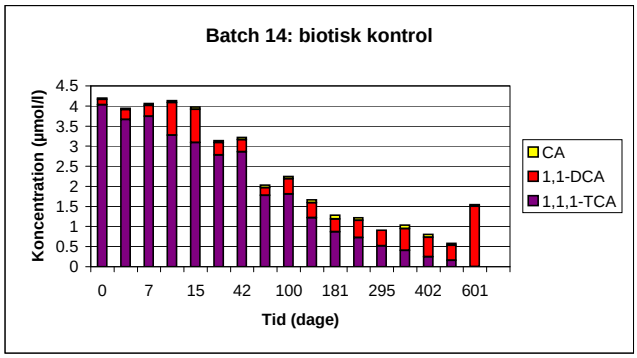


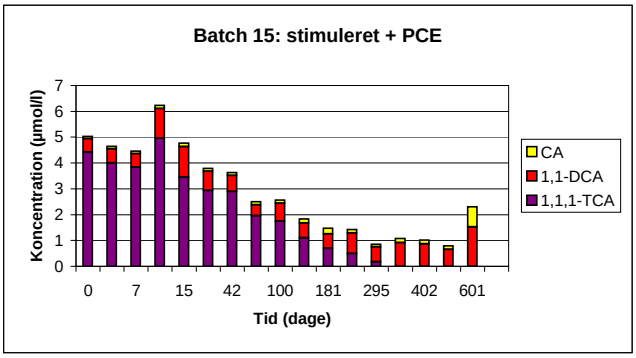


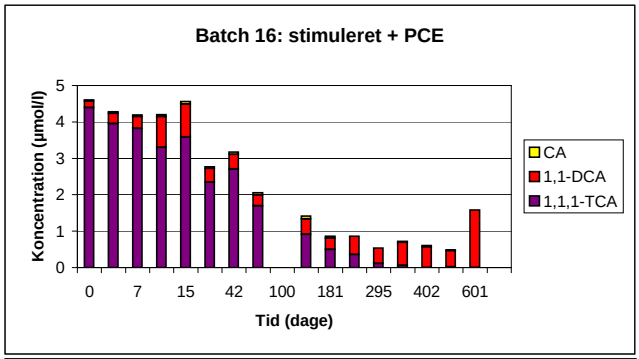


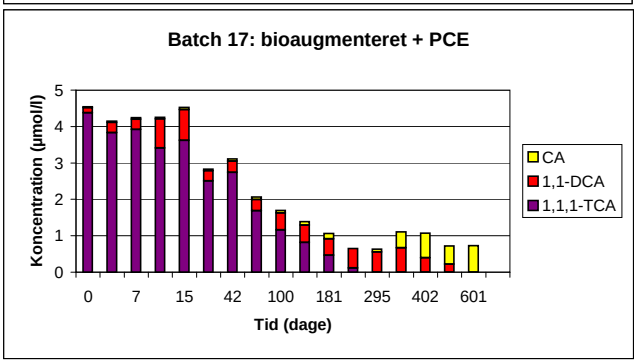
1.3 Balderbækvej Chlorerede ethaner
1.3.4 Fane (TCA), søjlediagrammer

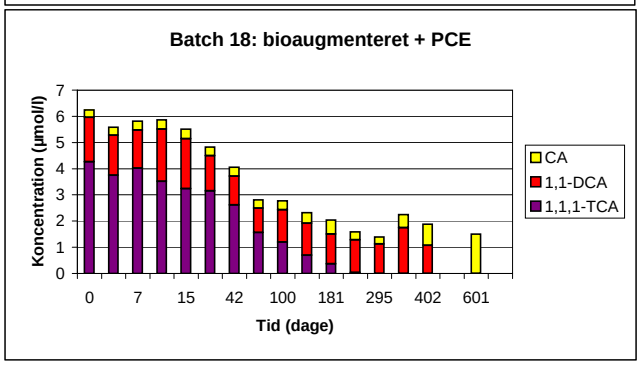






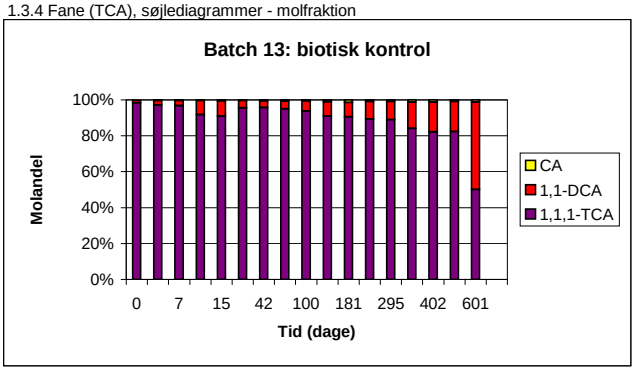


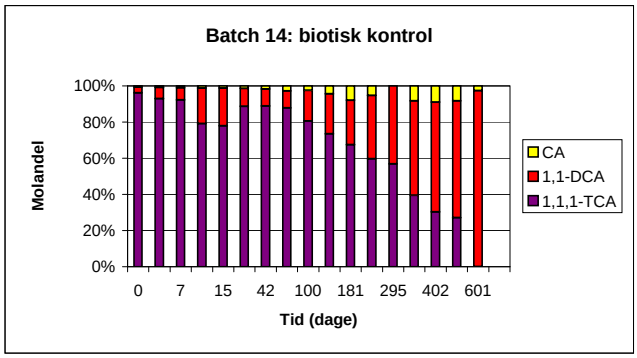


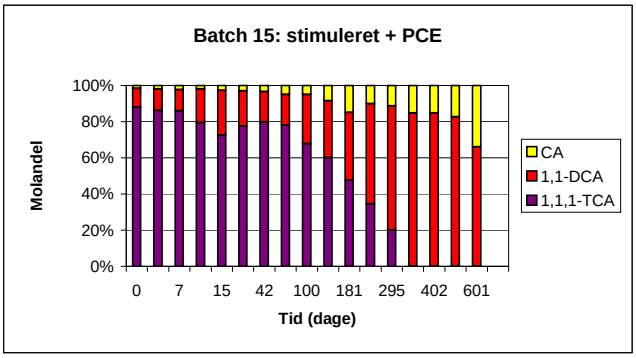


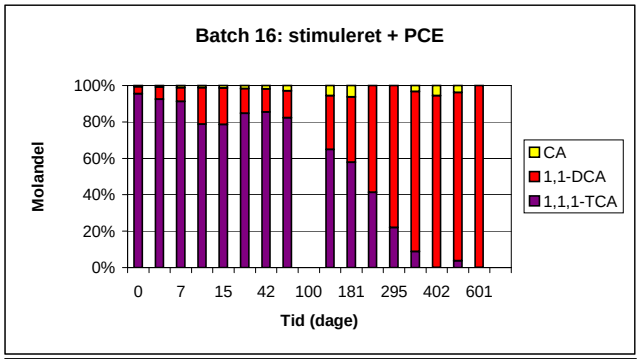
1.3 Balderbækvej Chlorerede ethaner

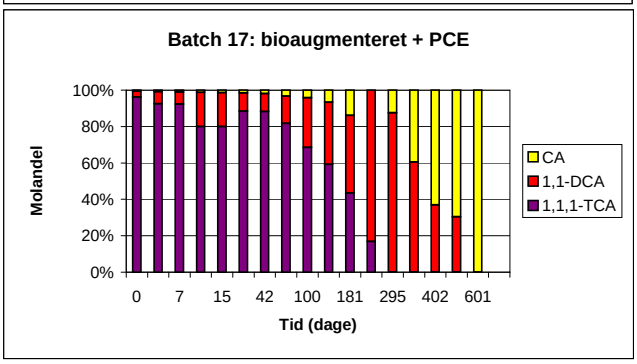
1.3.4 Fane (TCA), søjlediagrammer - molfraktion

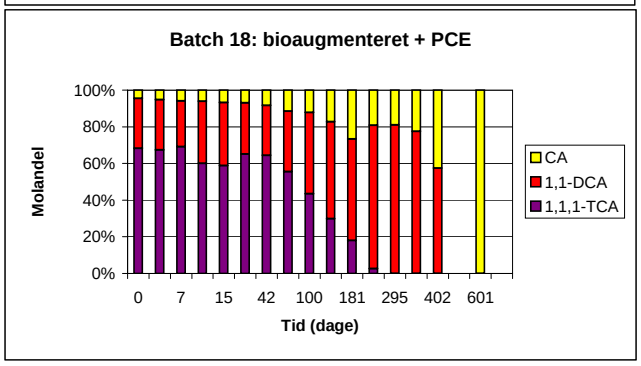






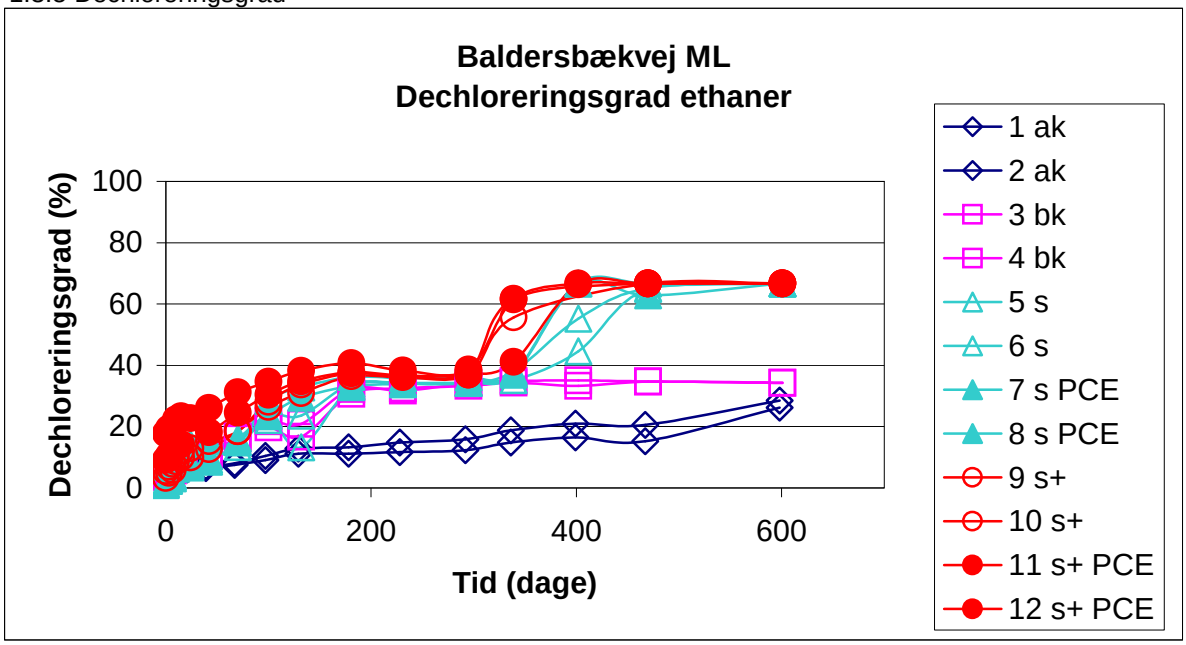


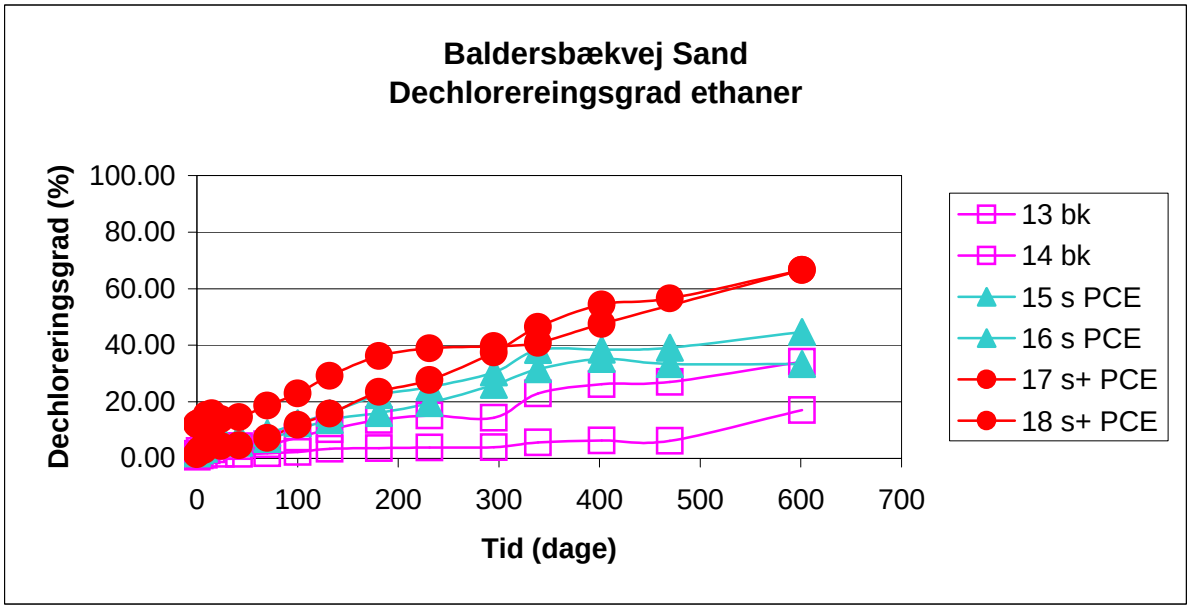




1.3 Balderbækvej Chlorerede ethaner

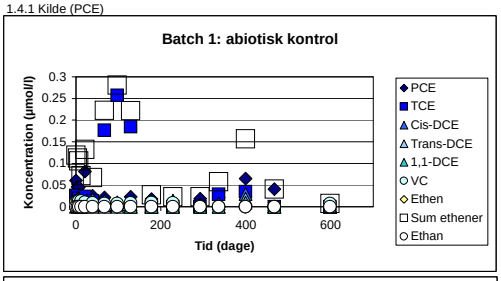
1.3.5 Dechloreringsgrad

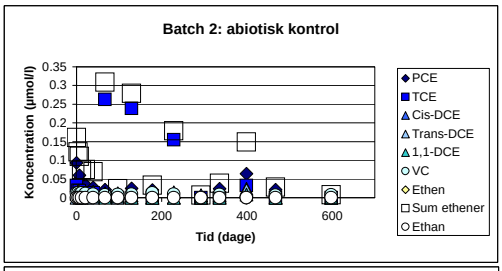


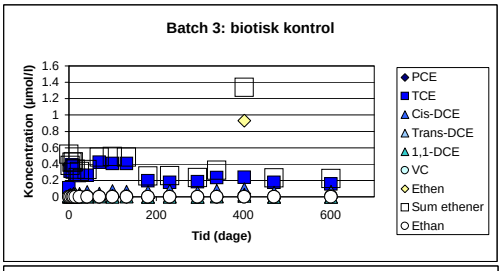


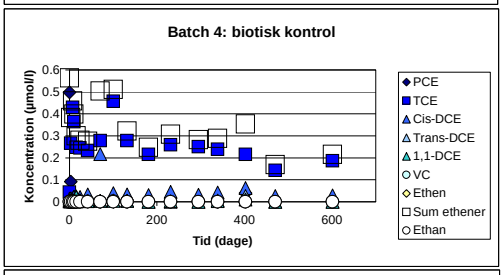
1.4 Baldersbækvej Chlorerede ethener

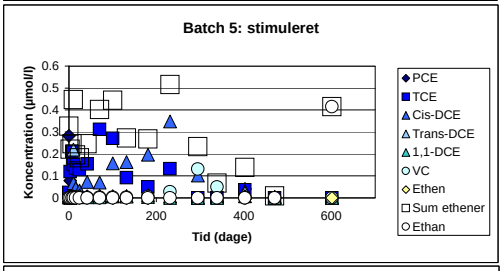
1.4.1 Kilde (PCE)

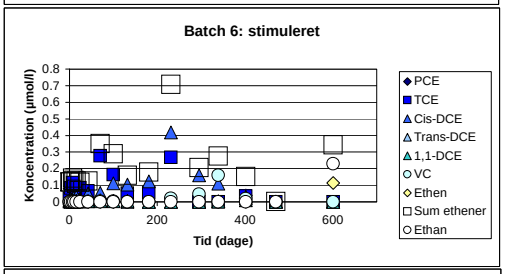


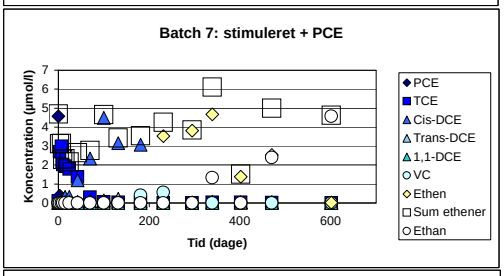


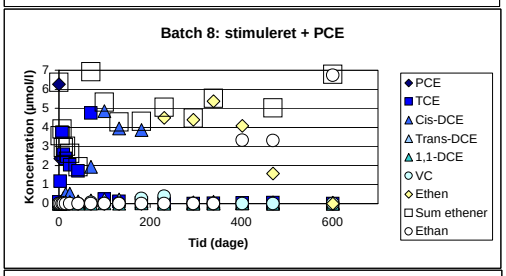


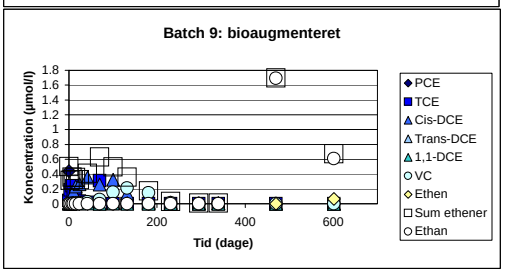


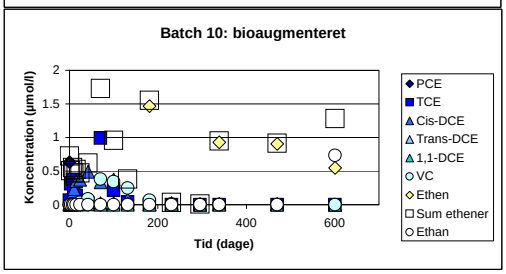


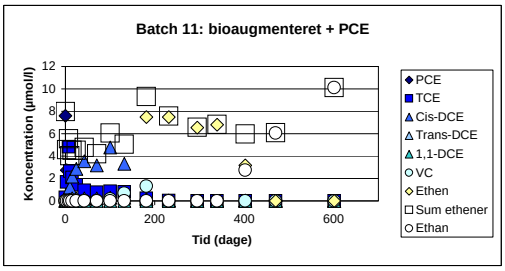


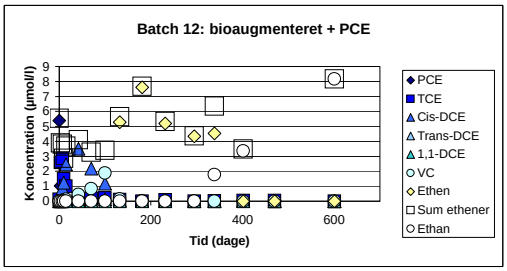






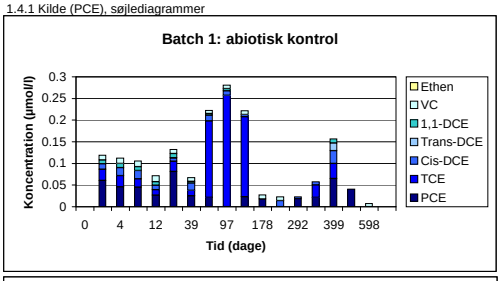


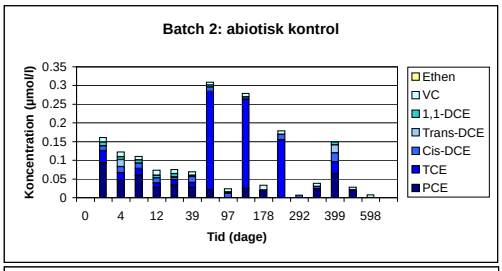


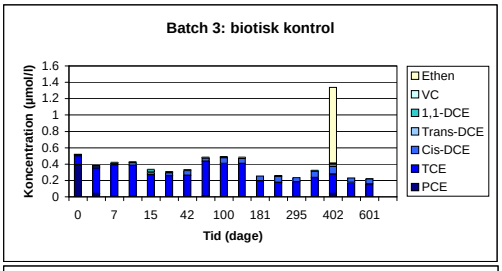


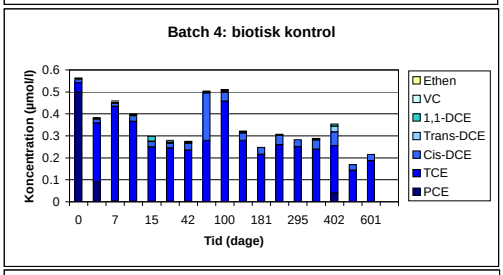
1.4 Baldersbækvej Chlorerede ethener

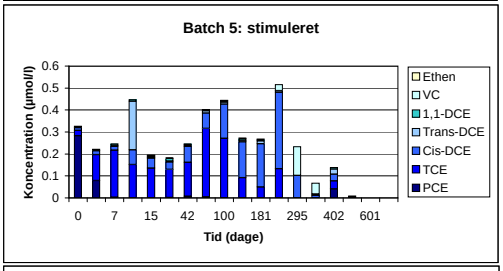
1.4.1 Kilde (PCE), søjlediagrammer

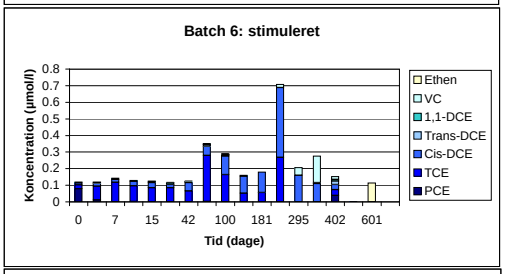


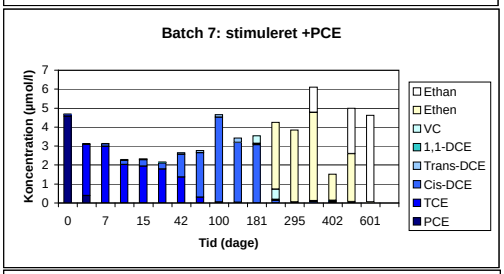


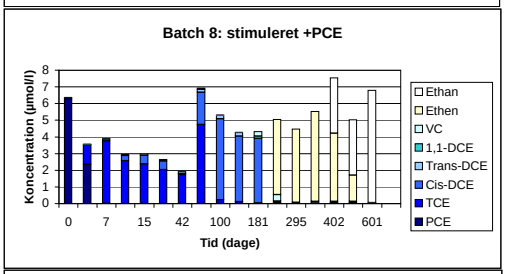


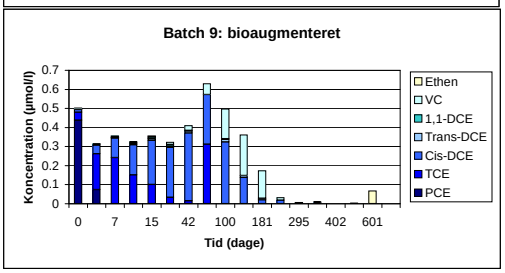


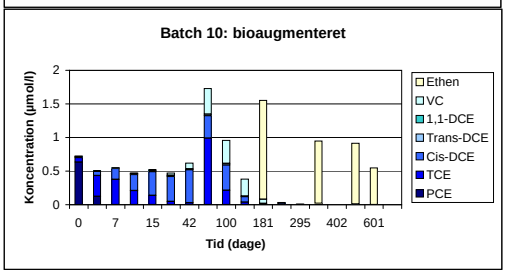


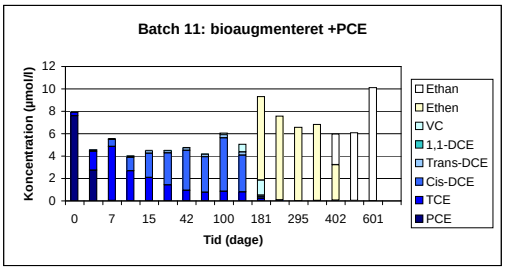


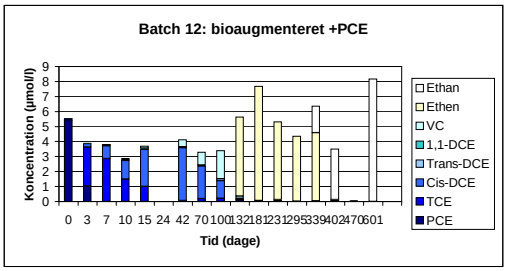




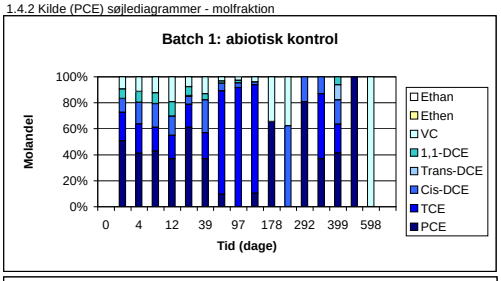


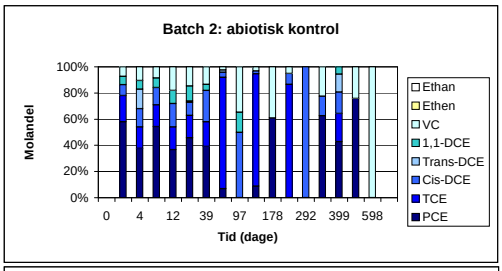


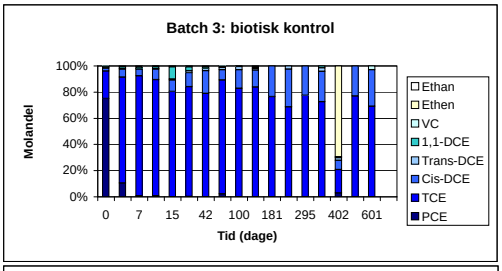


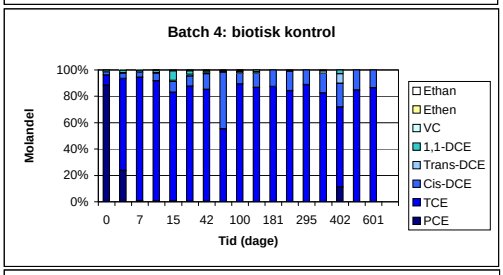


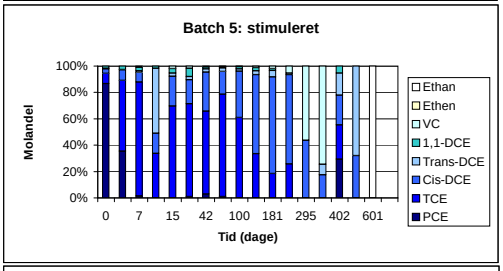
1.4 Baldersbækvej Chlorerede ethener
1.4.2 Kilde (PCE) søjlediagrammer - molfraktion

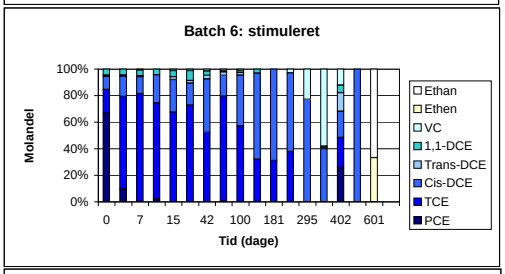


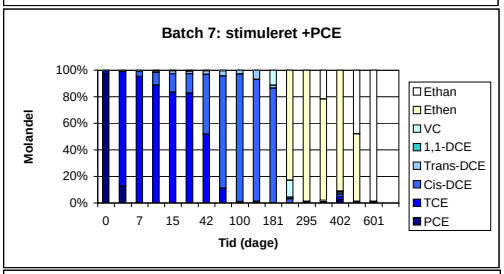


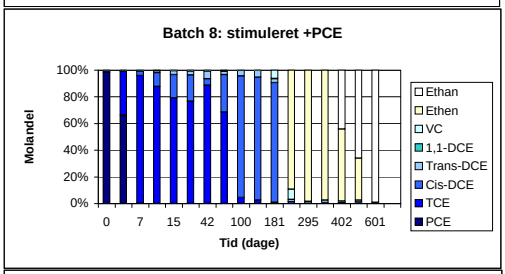


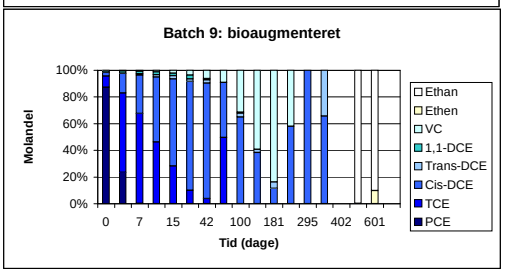


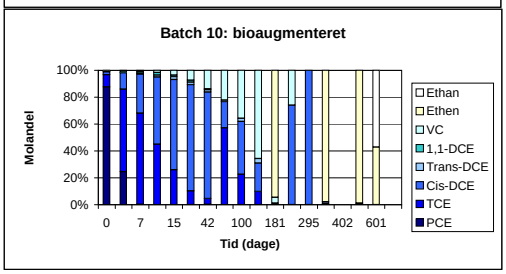


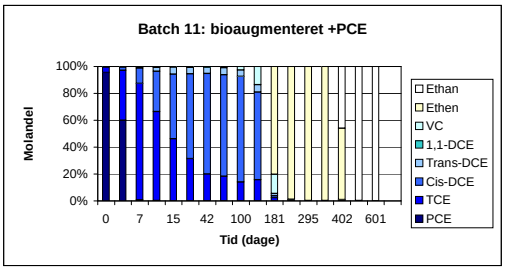


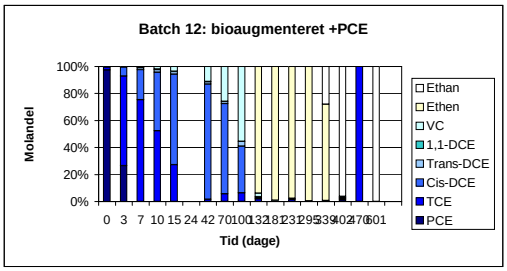




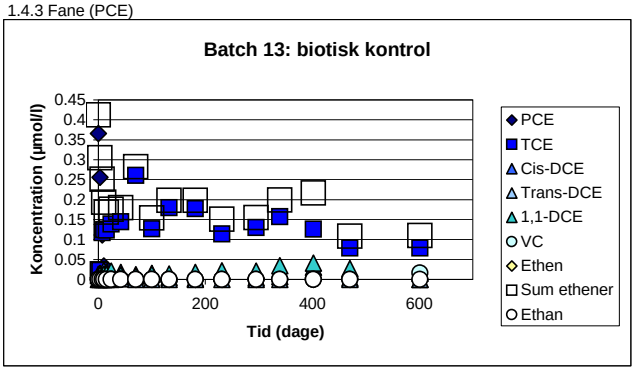


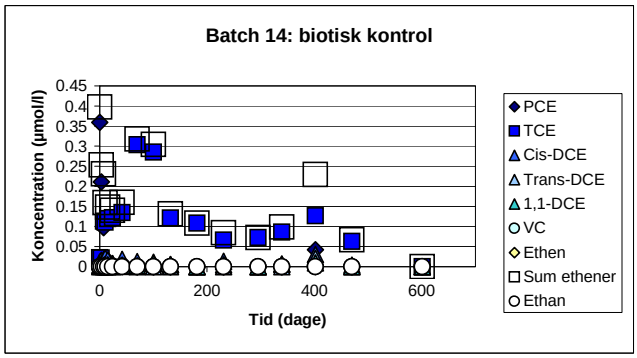


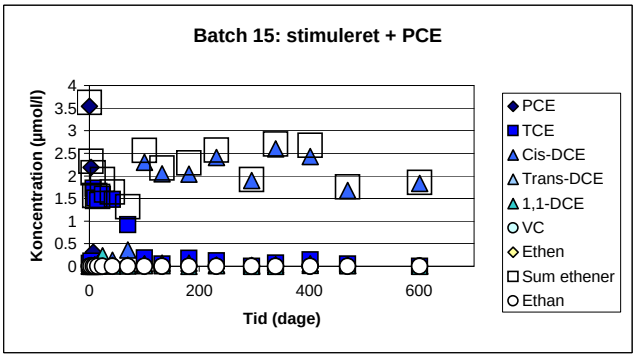


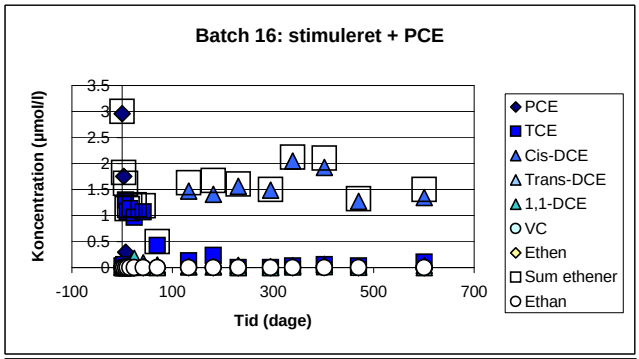


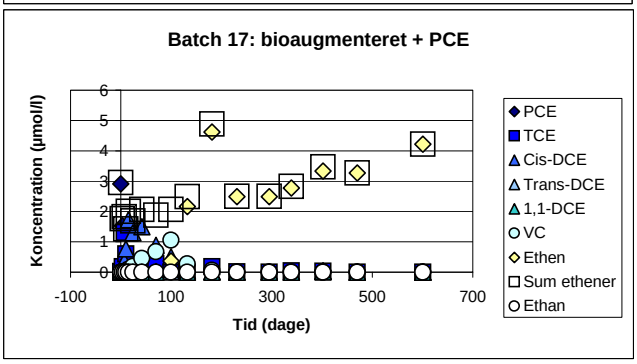
1.4 Baldersbækvej Chlorerede ethener
1.4.3 Fane (PCE)

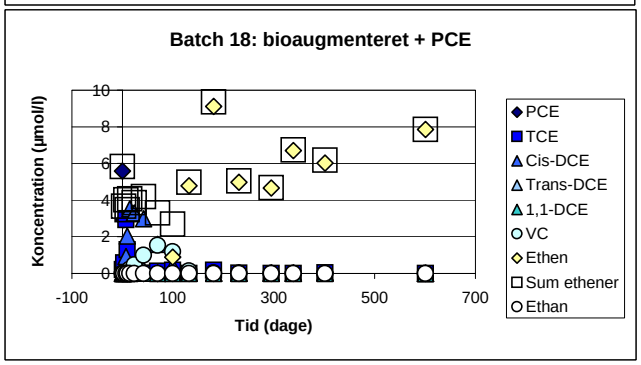




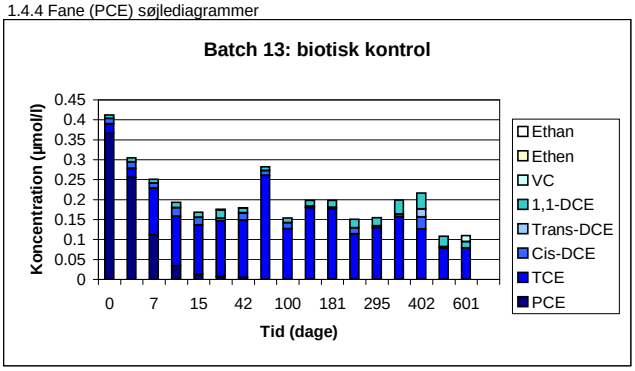


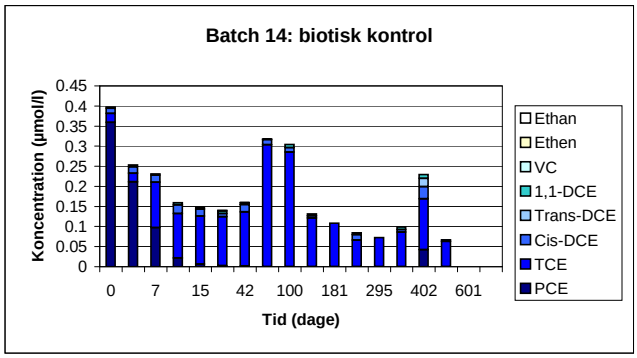


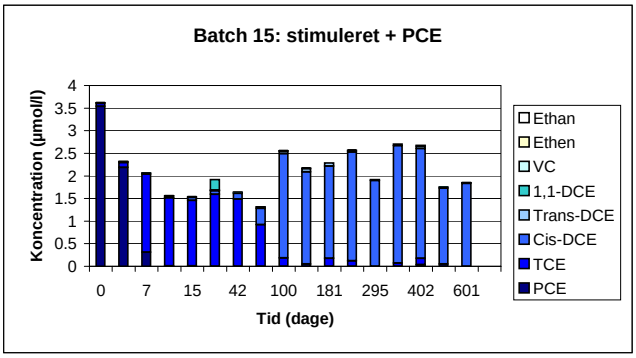


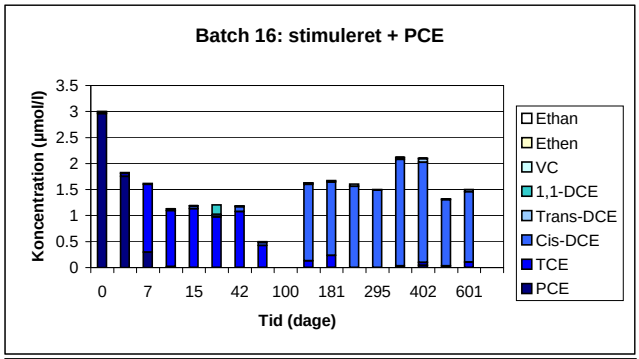


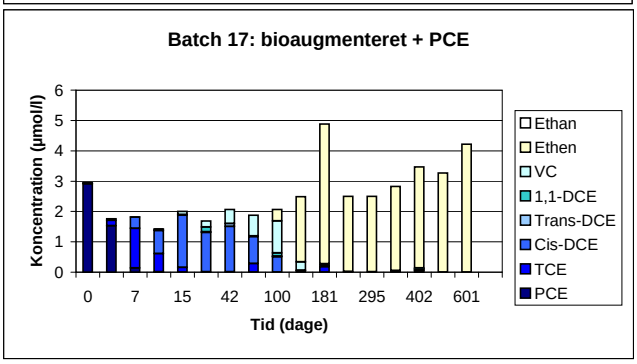
1.4 Balderbækvej Chlorerede ethener
1.4.4 Fane (PCE) søjlediagrammer

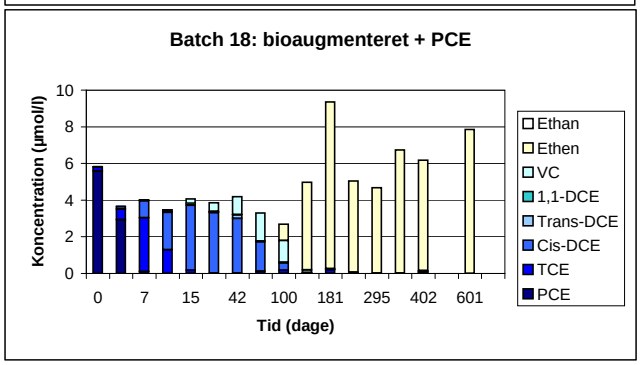






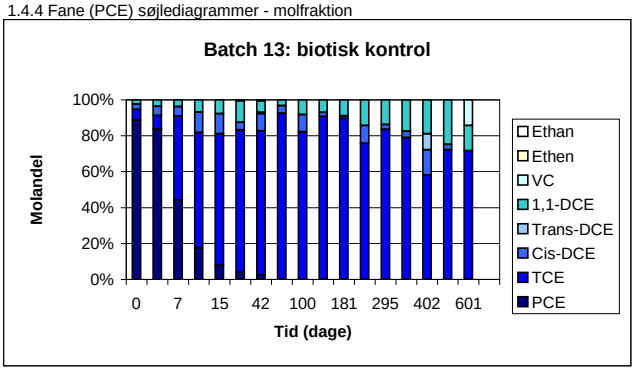


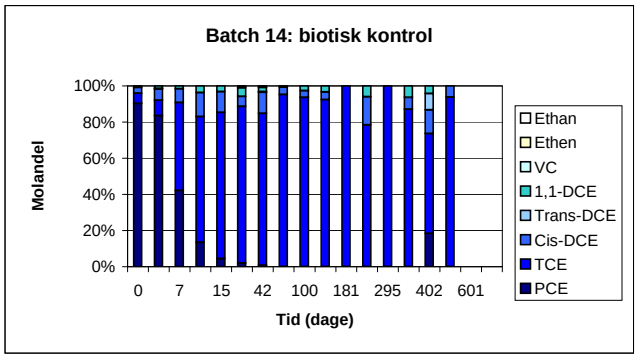


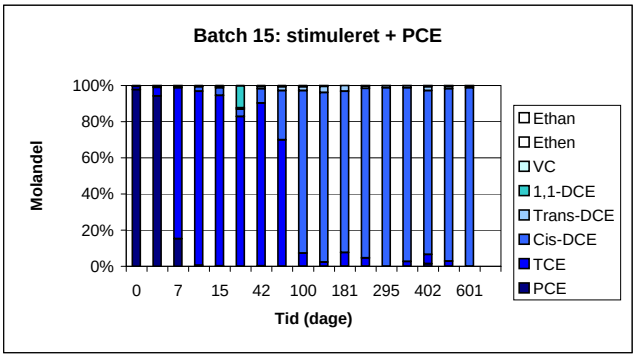


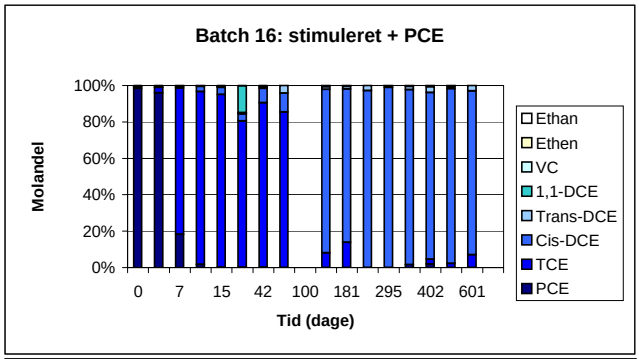
1.4 Balderbækvej Chlorerede ethener

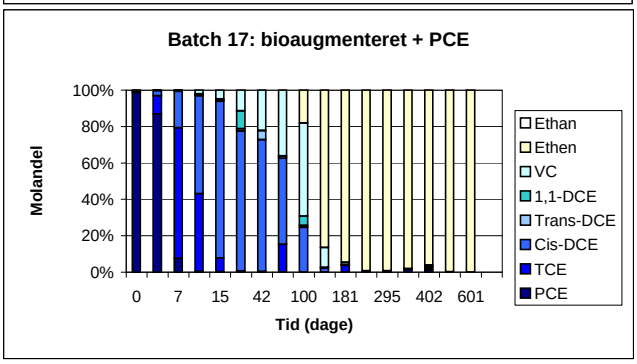
1.4.4 Fane (PCE) søjlediagrammer - molfraktion

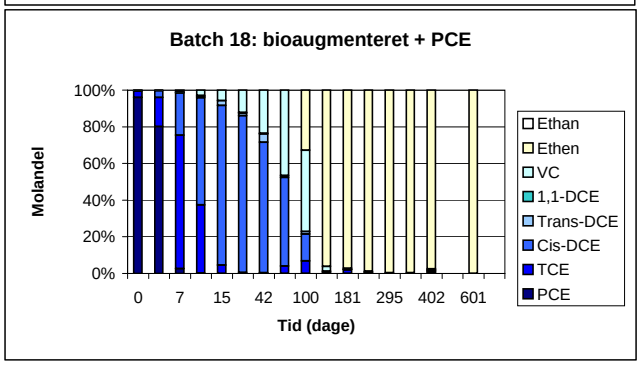






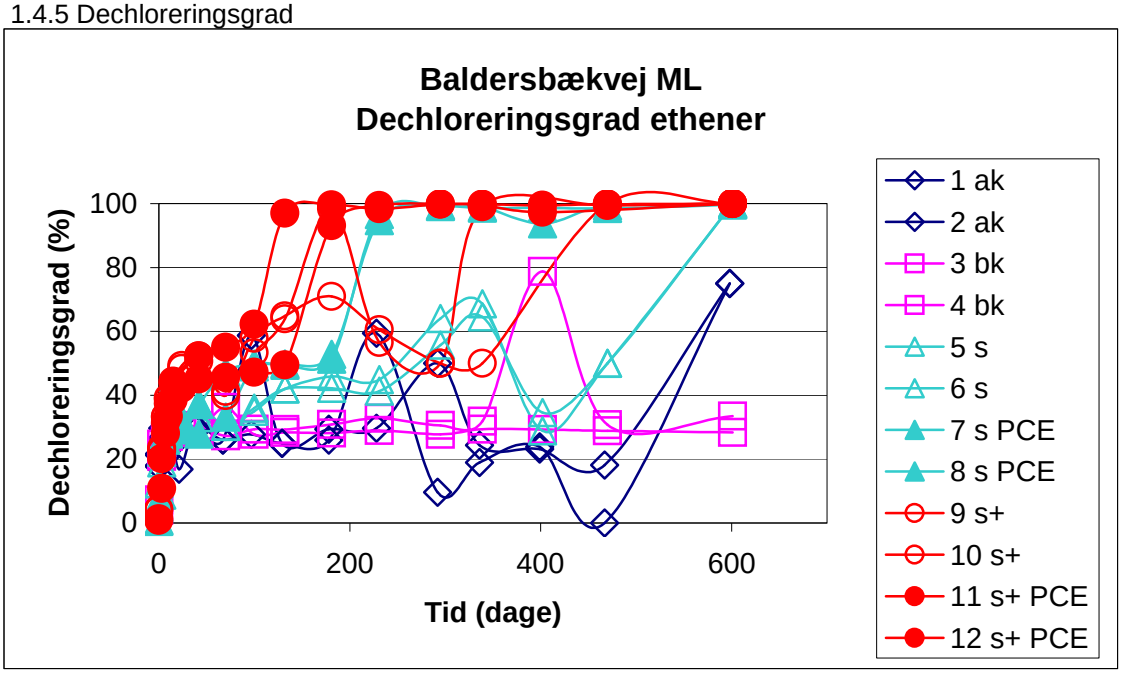


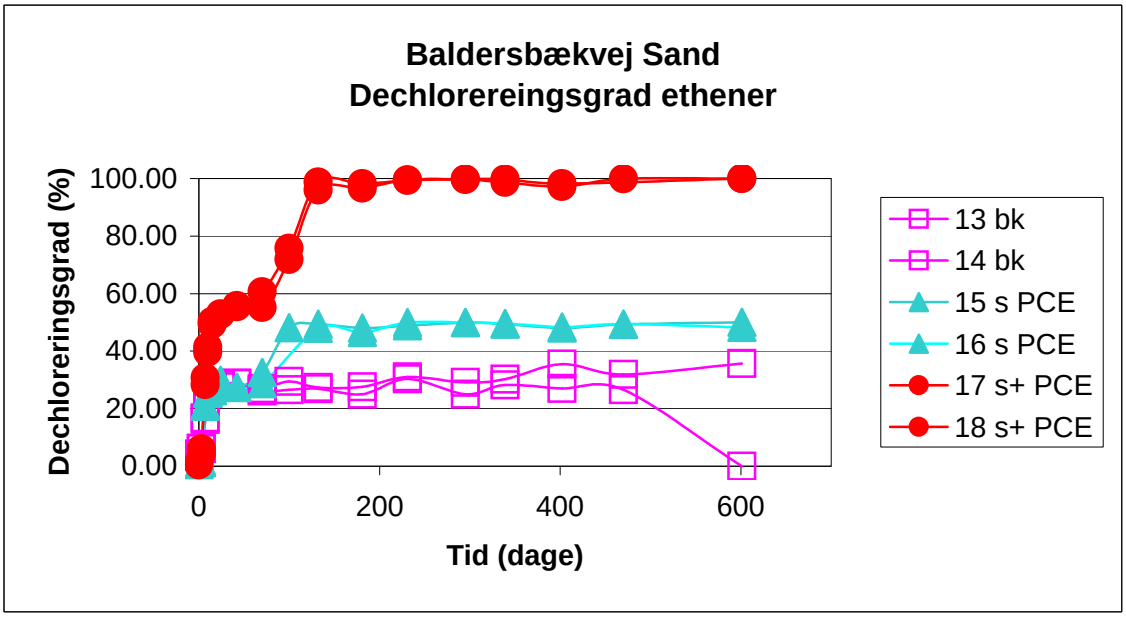




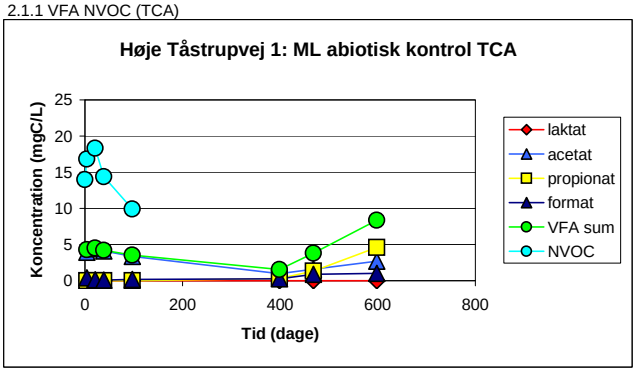
1.4 Baldersbækvej Chlorerede ethener

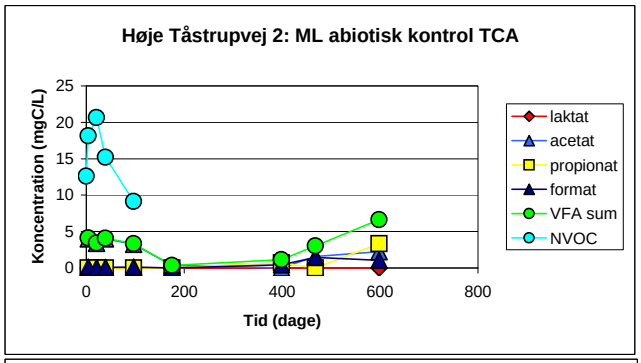
1.4.5 Dechloreringsgrad

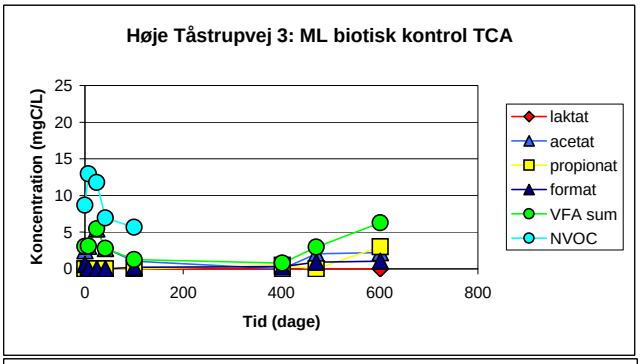


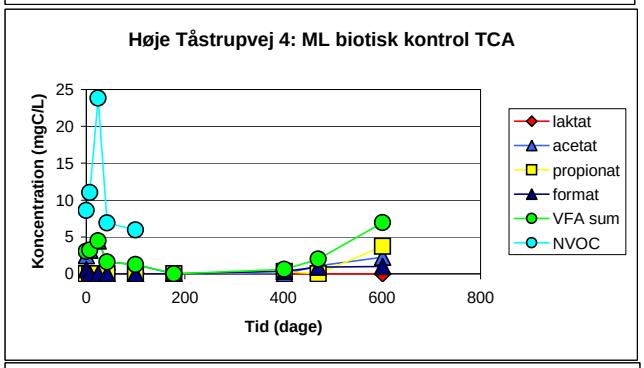


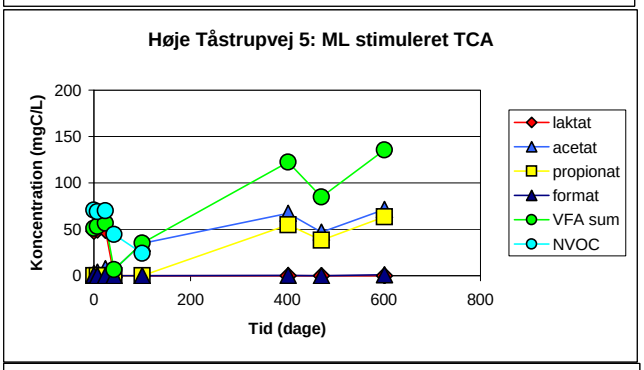
2.1 Høje Tåstrup Donor
2.1.1 VFA NVOC (TCA)

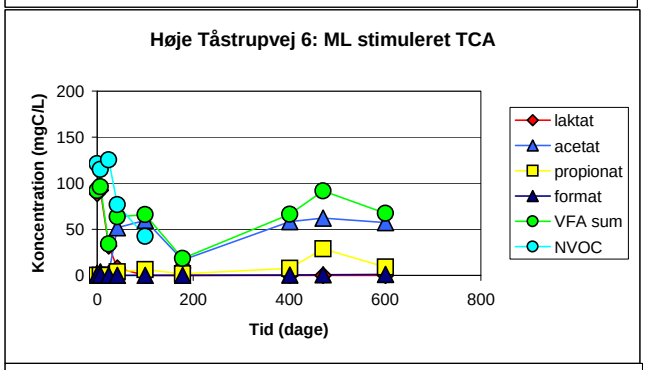


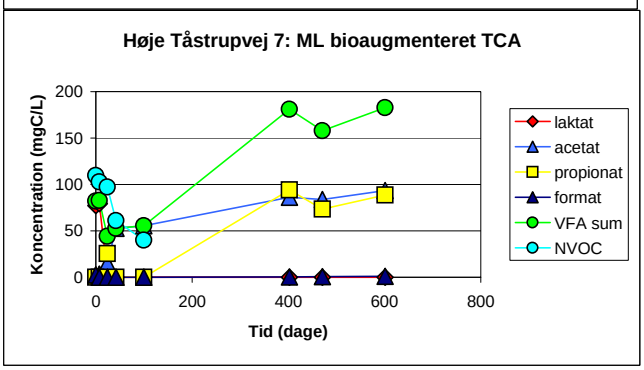


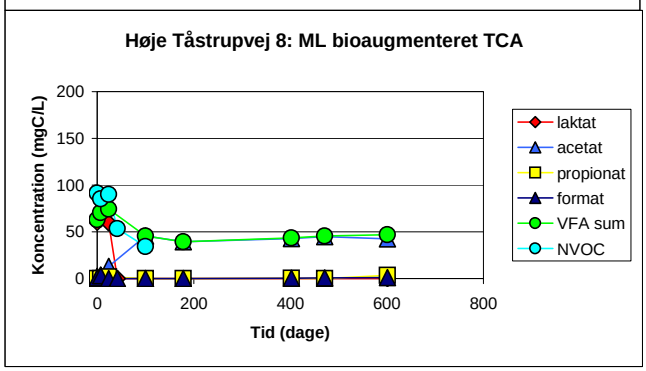




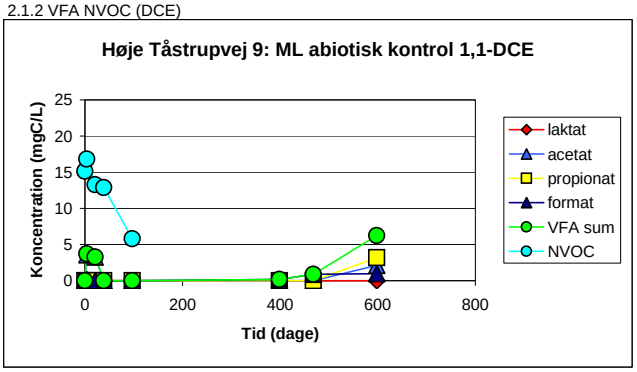


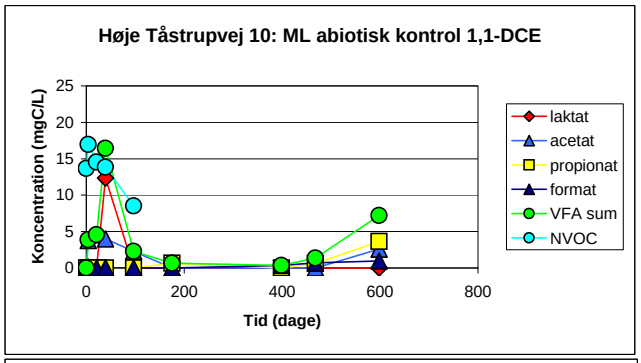


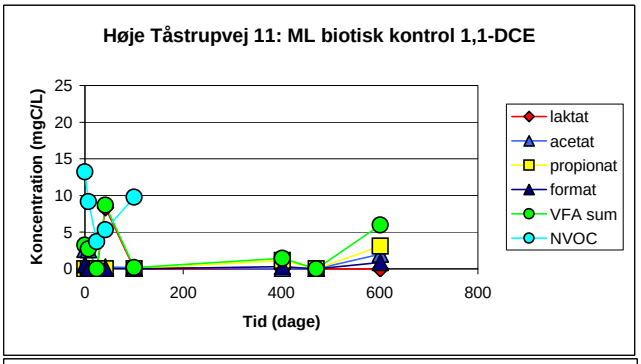


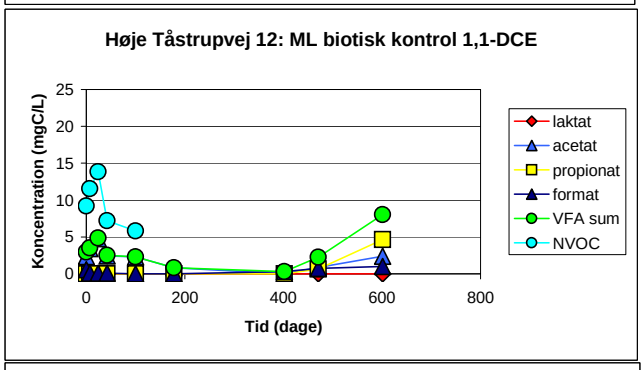


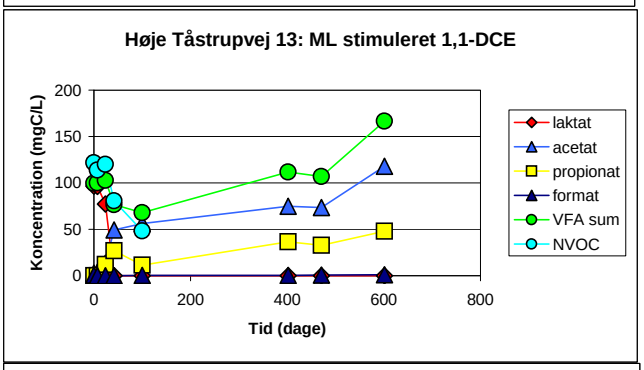
2.1 Høje Tåstrup Donor
2.1.2 VFA NVOC (DCE)

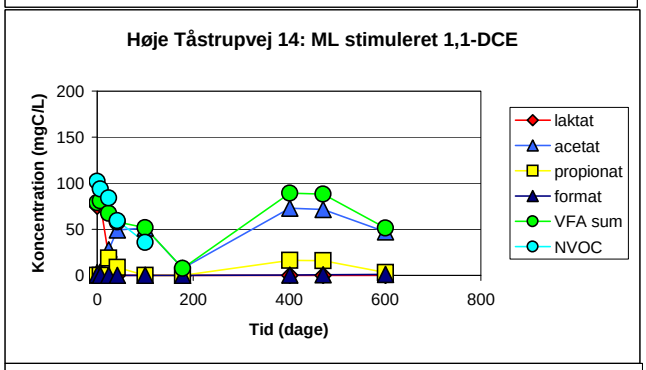


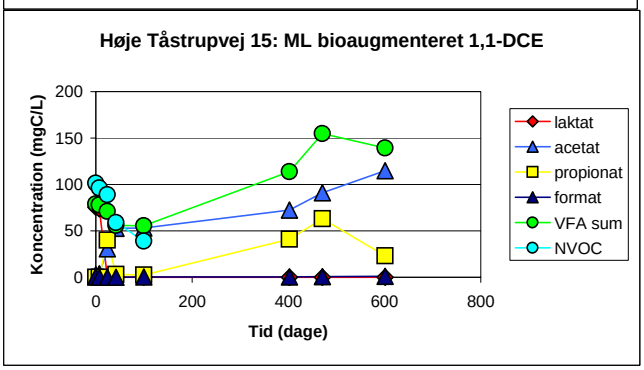


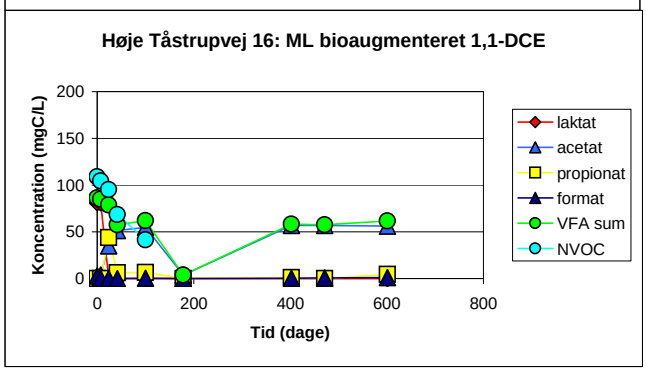




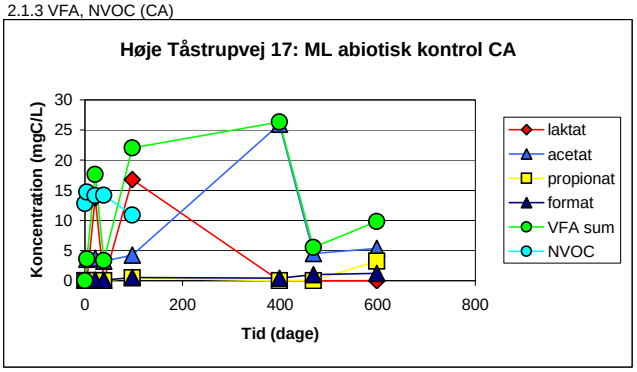


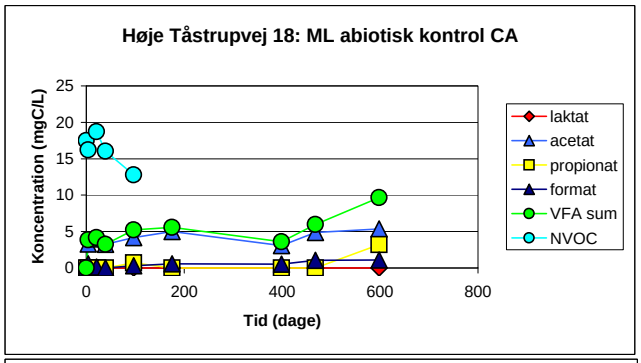


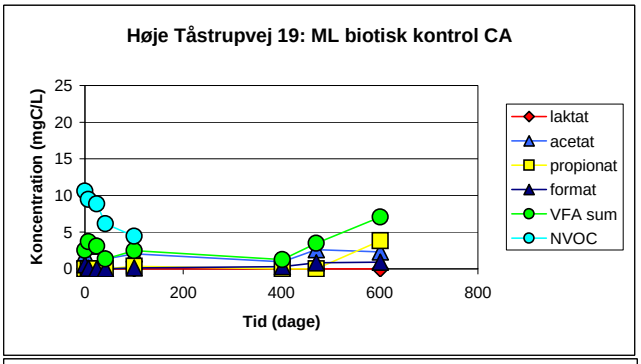


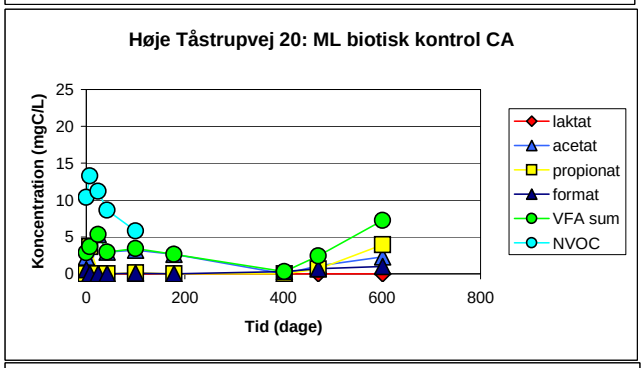


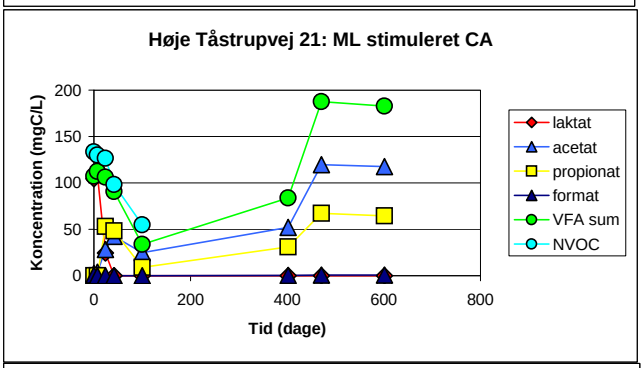
2.1 Høje Tåstrup Donor
2.1.3 VFA, NVOC (CA)

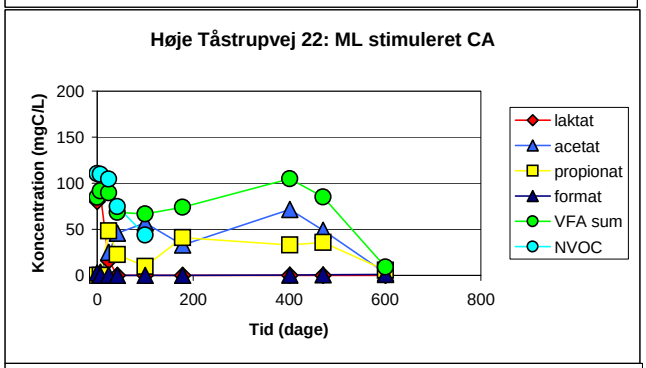


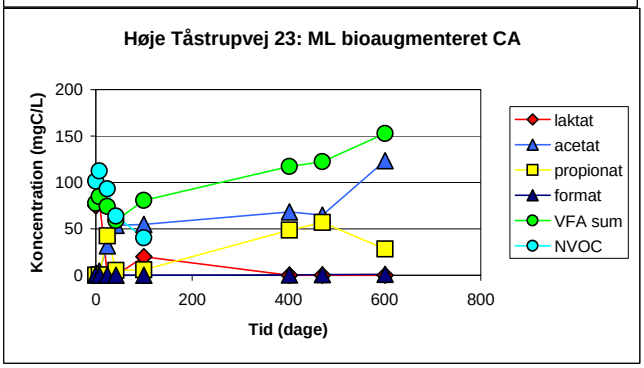


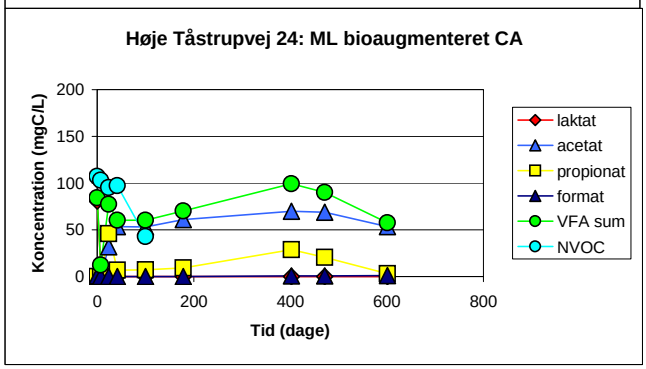






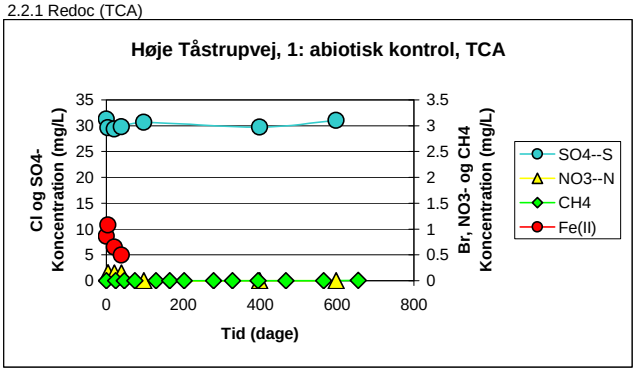


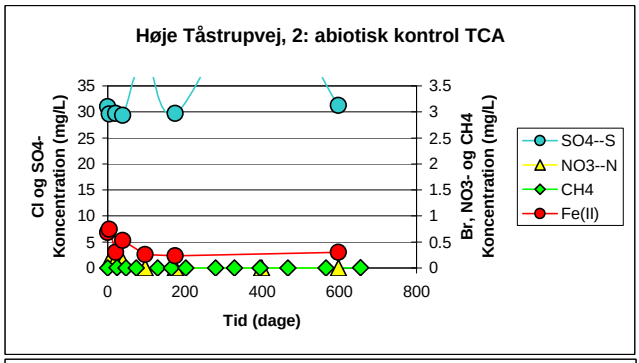


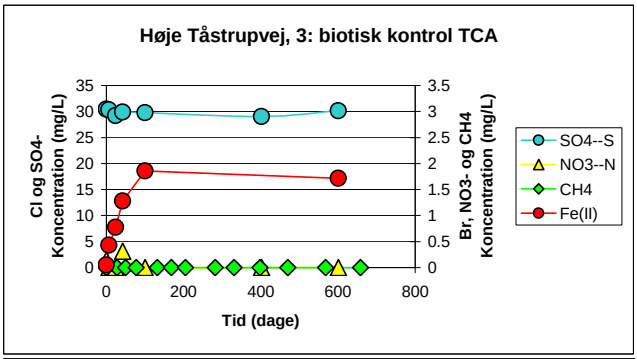


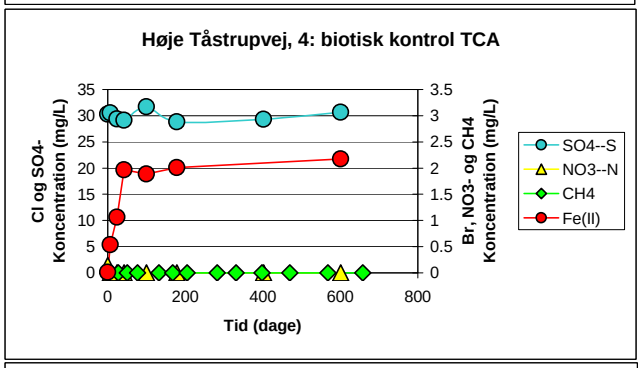
2.2 Høje Tåstru Redox

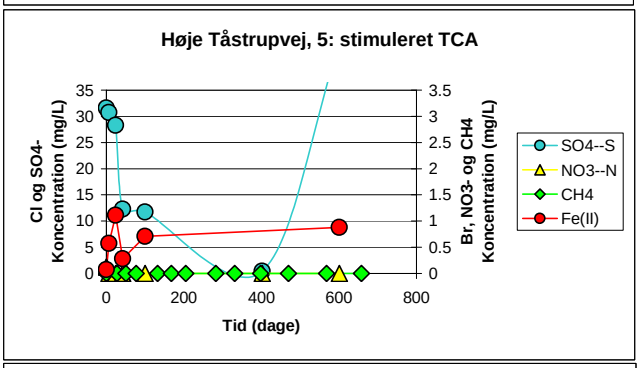
2.2.1 Redoc (TCA)

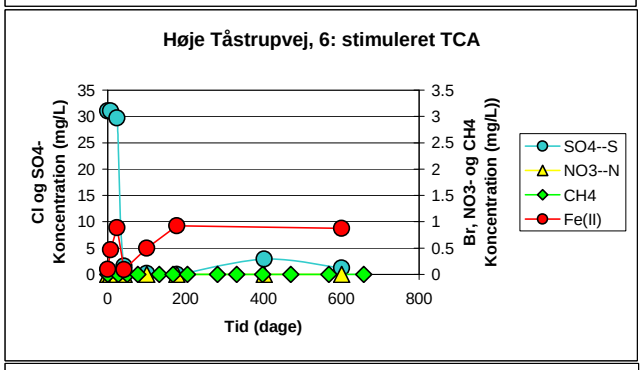


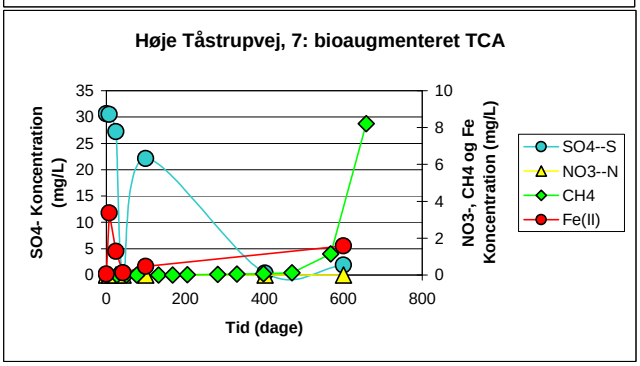


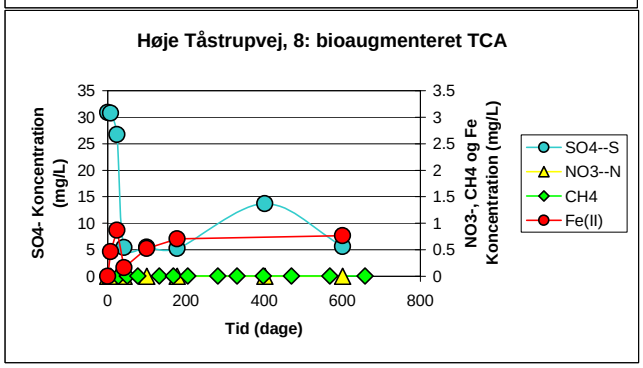




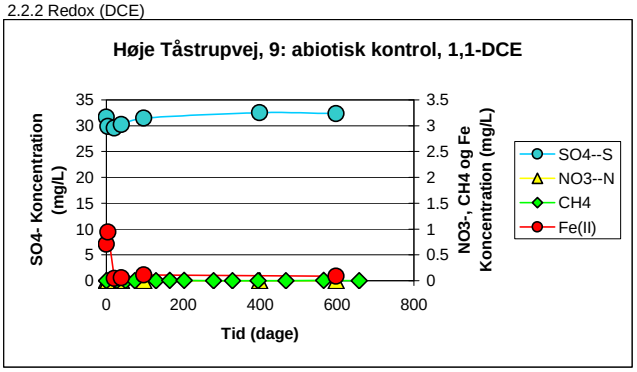


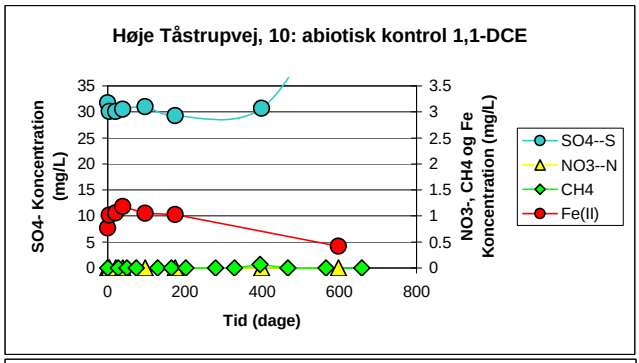


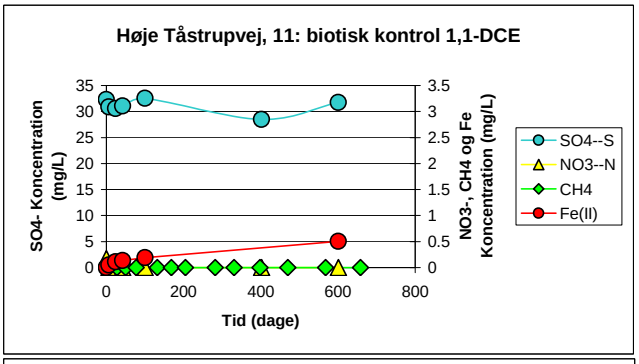


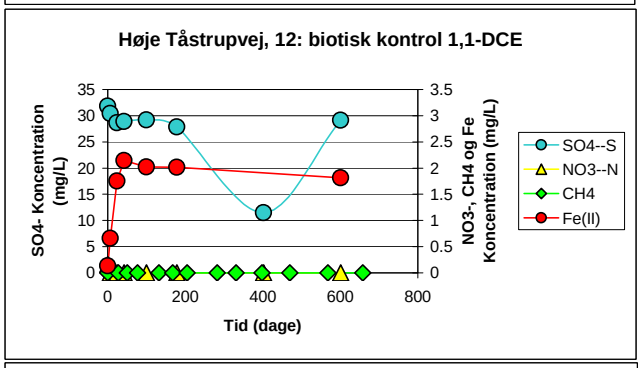


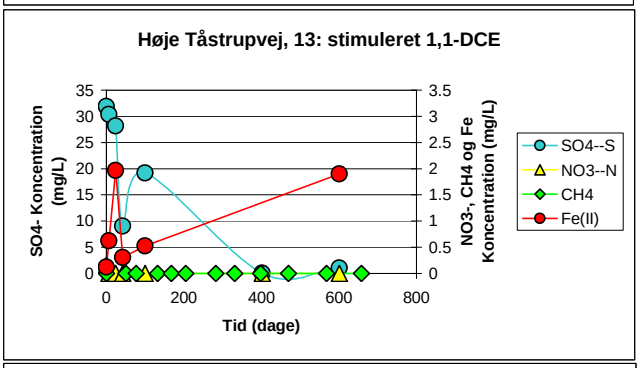
2.2 Høje Tåstrup Redox
2.2.2 Redox (DCE)

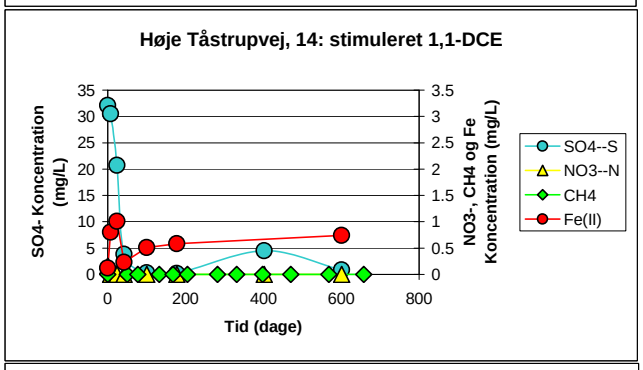


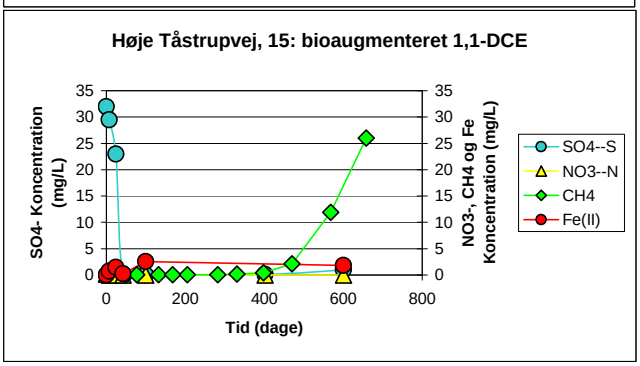


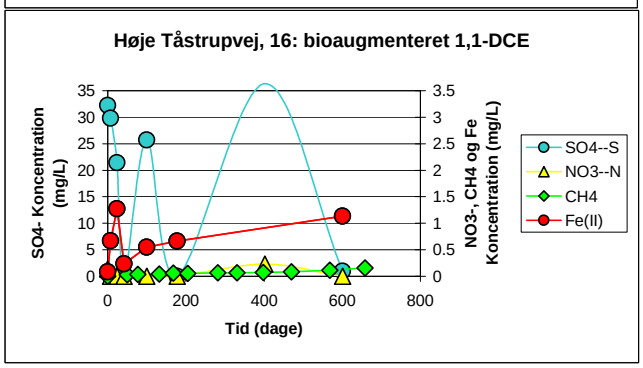




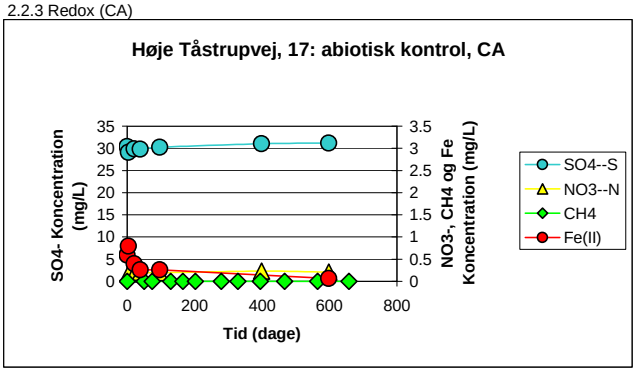


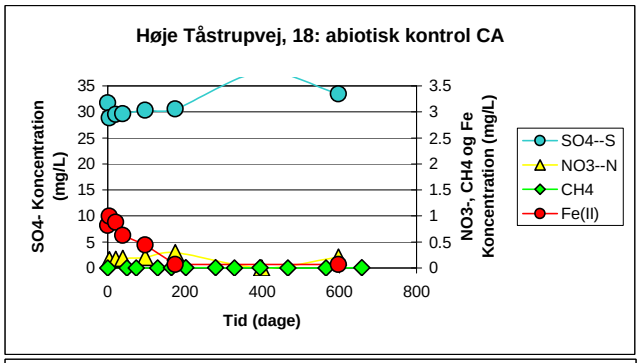


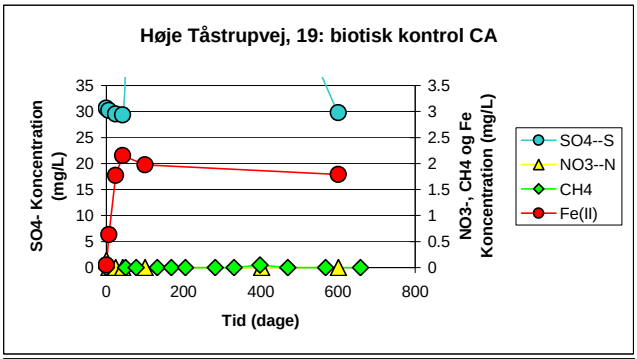


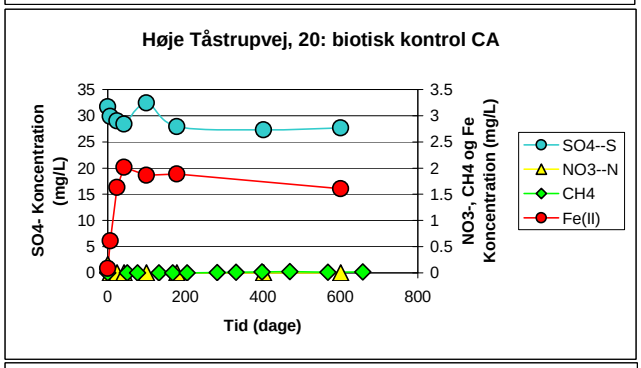


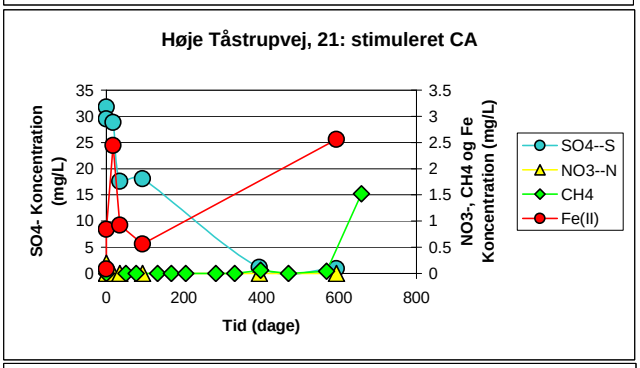
2.2 Høje Tåstrup Redox
2.2.3 Redox (CA)

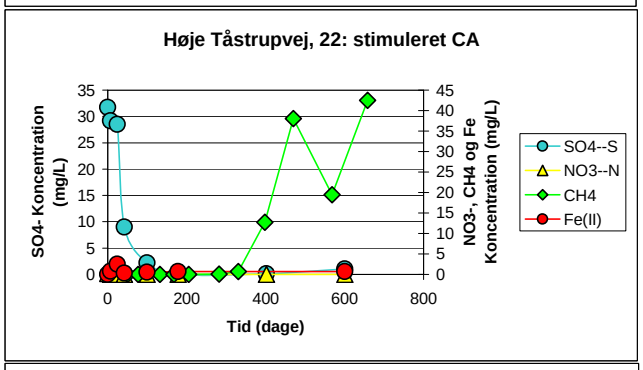


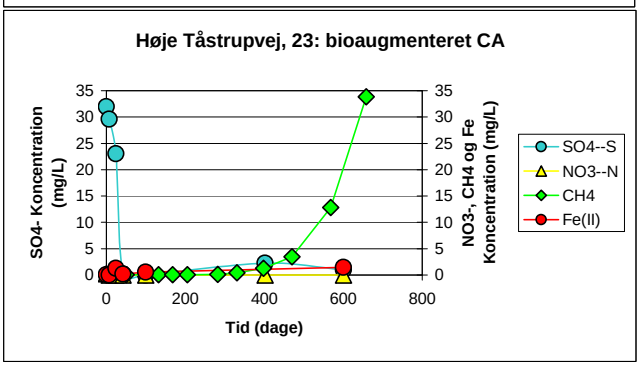


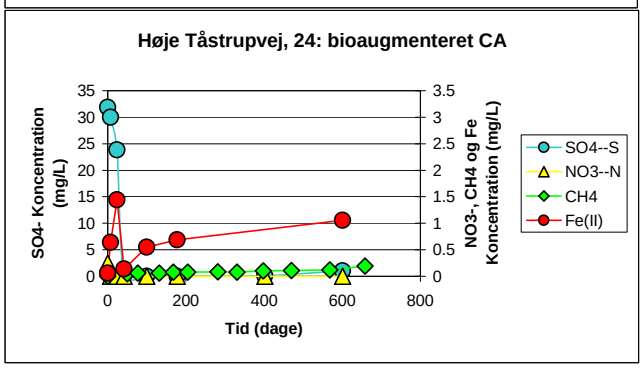






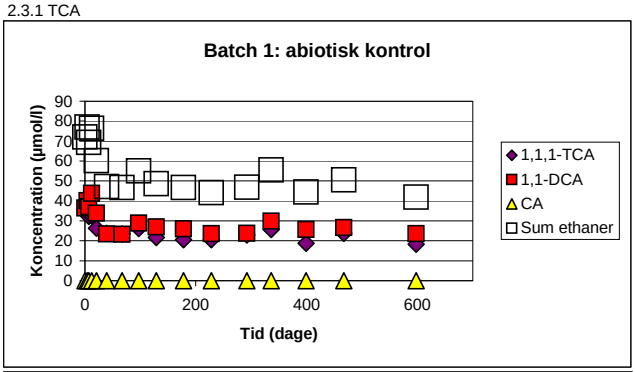


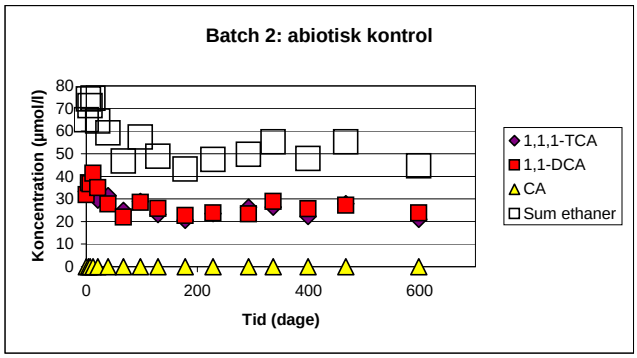


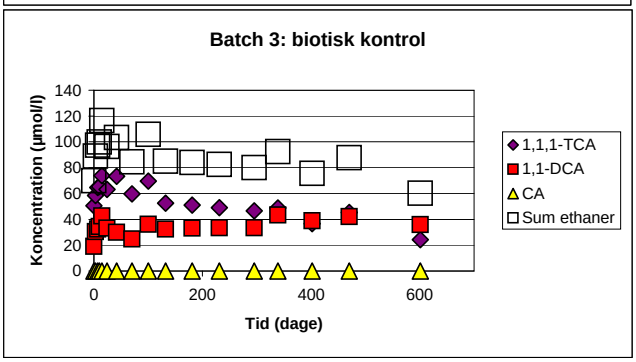


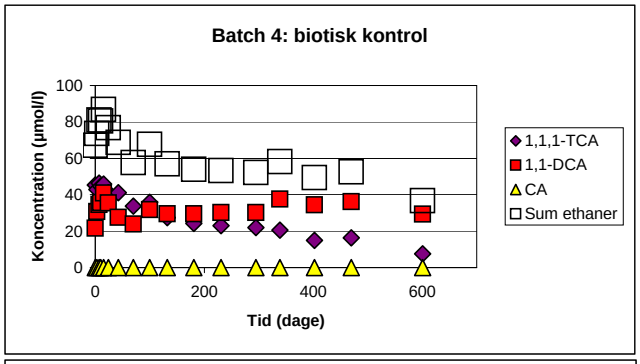
2.3 Høje Tåstrup Chlorerede ethaner

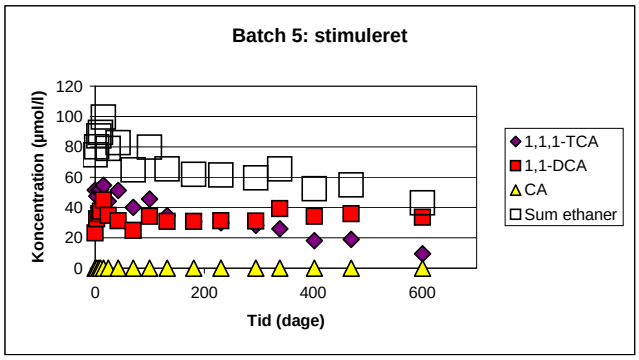
2.3.1 TCA

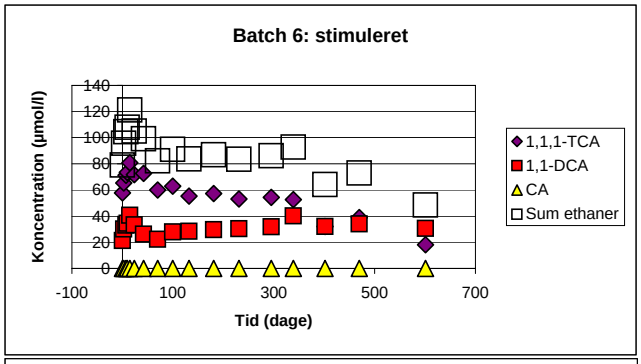


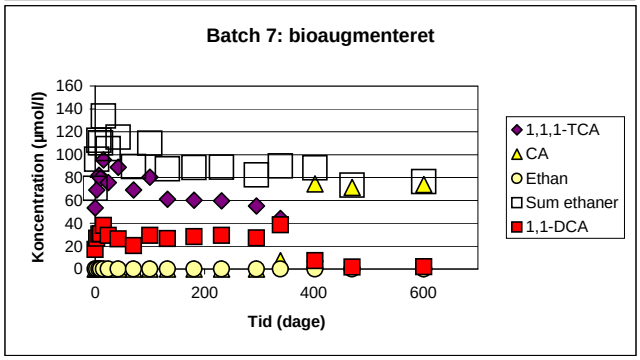


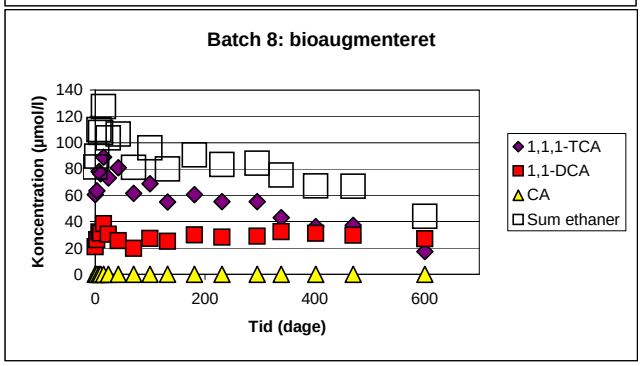






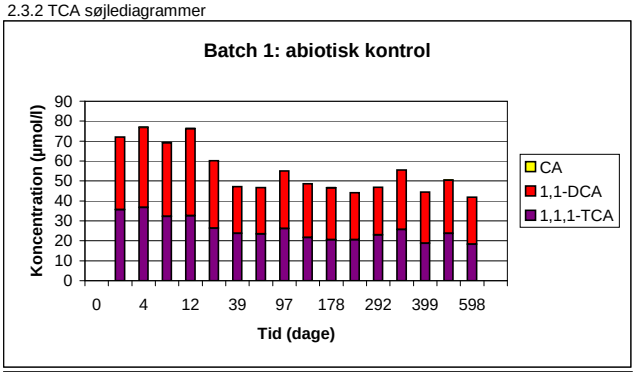


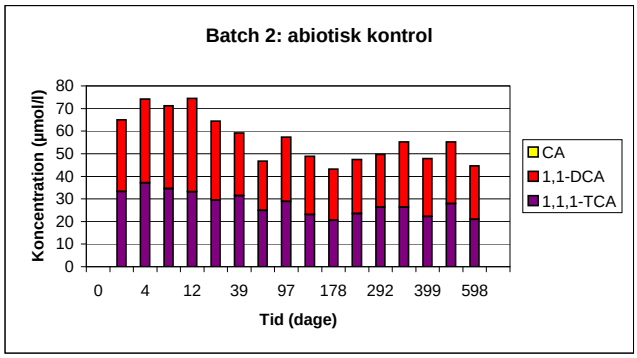


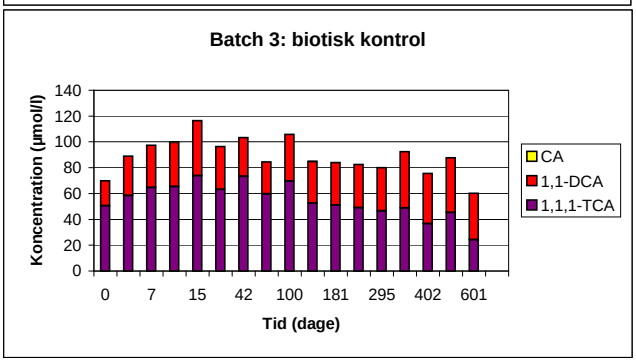


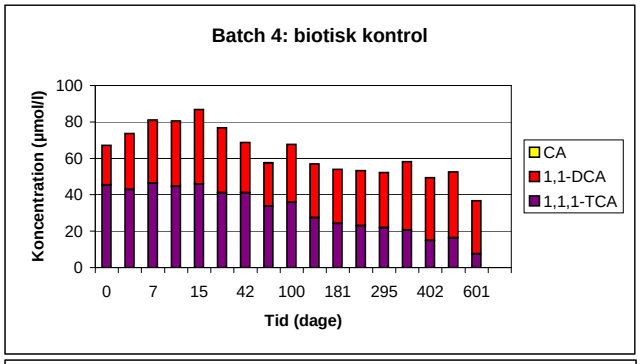
2.3 Høje Tåstrup Chlorerede ethaner

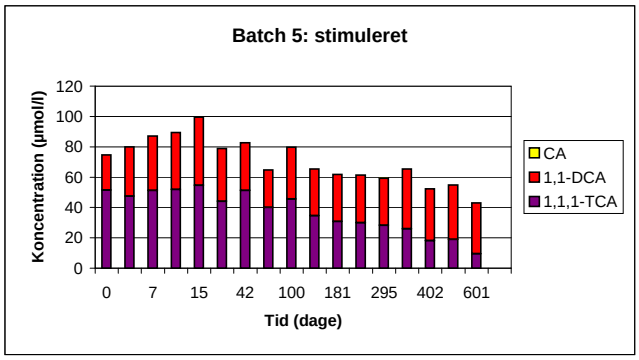
2.3.2 TCA søjlediagrammer

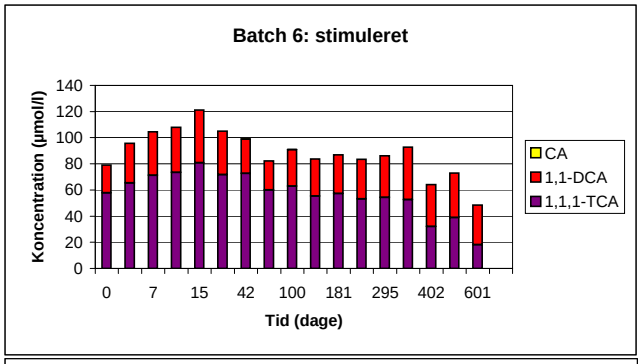


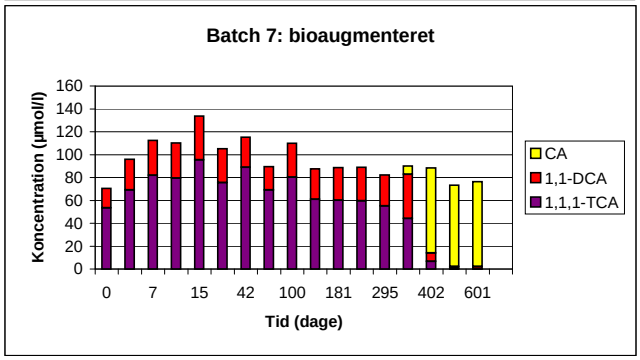


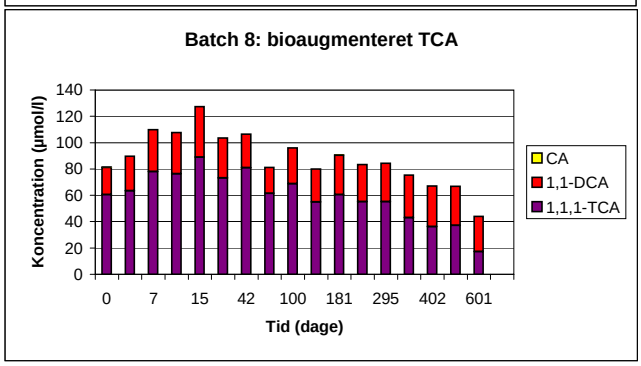






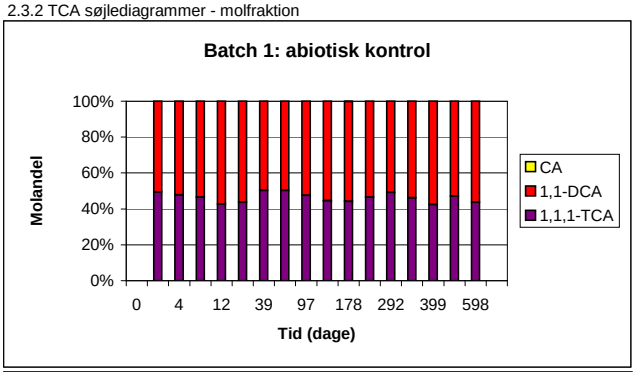


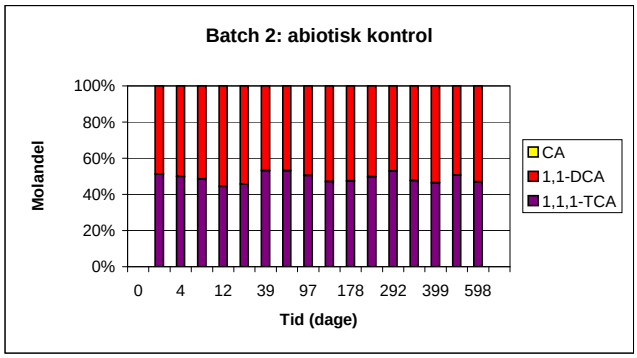


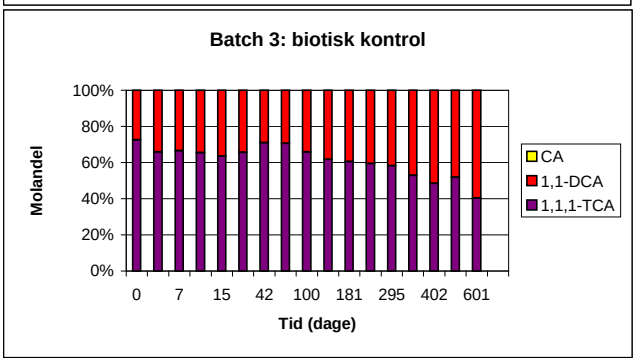


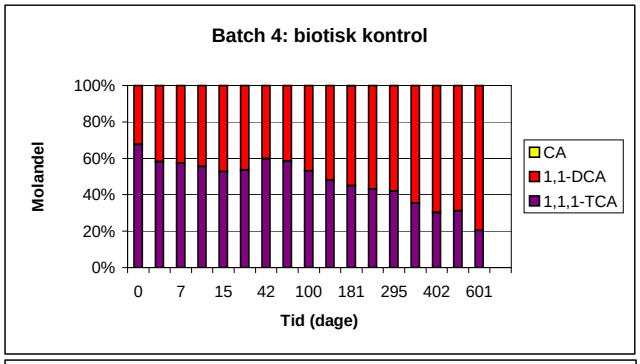
2.3 Høje Tåstrup Chlorerede ethaner

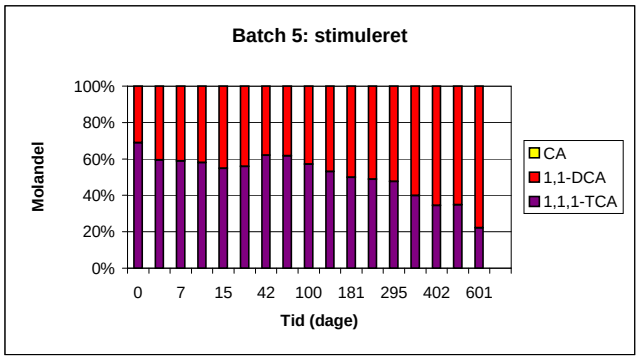
2.3.2 TCA søjlediagrammer - molfraktion

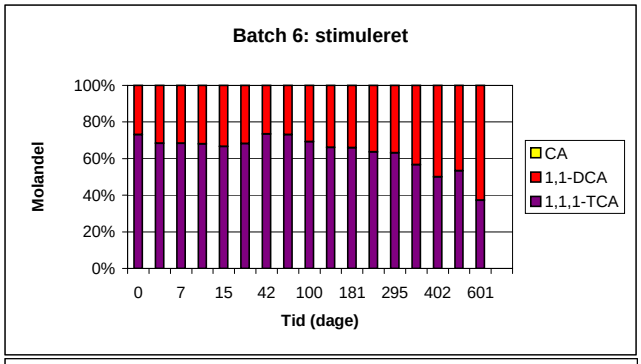


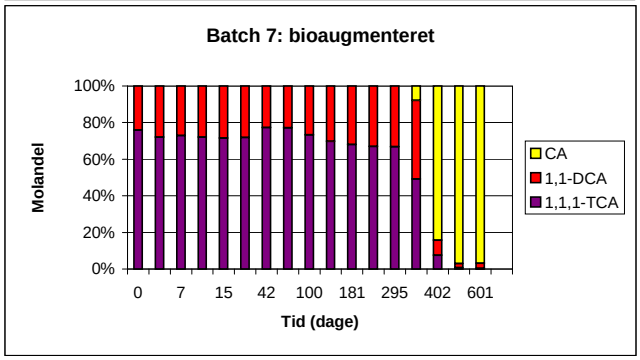


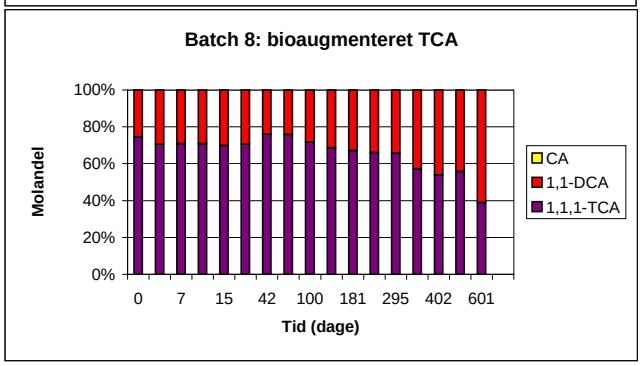






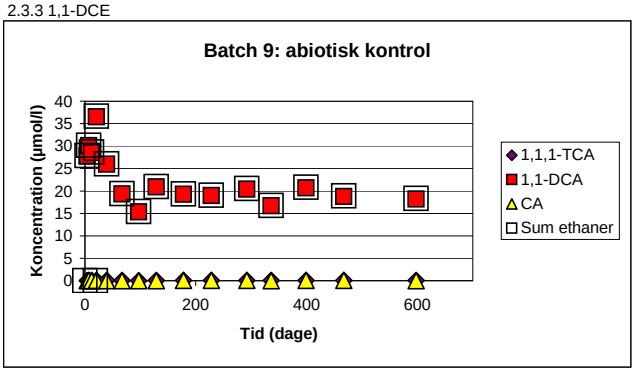


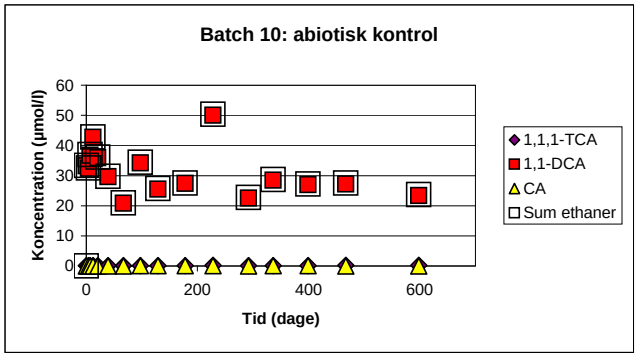


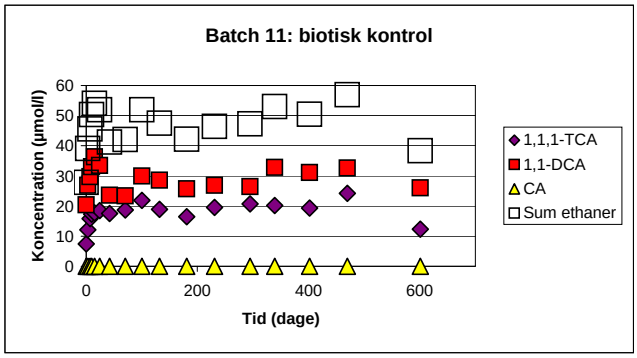


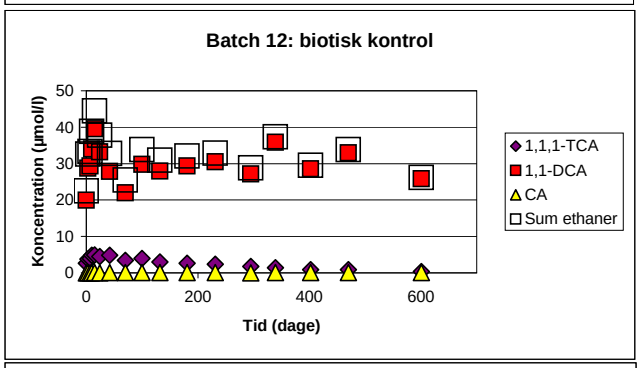
2.3 Høje Tåstrup Chlorerede ethaner

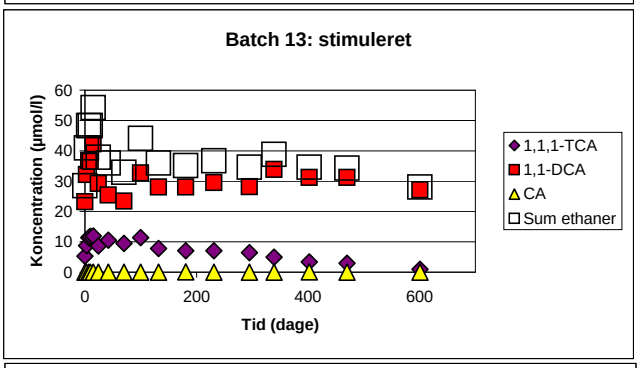
2.3.3 1,1-DCE

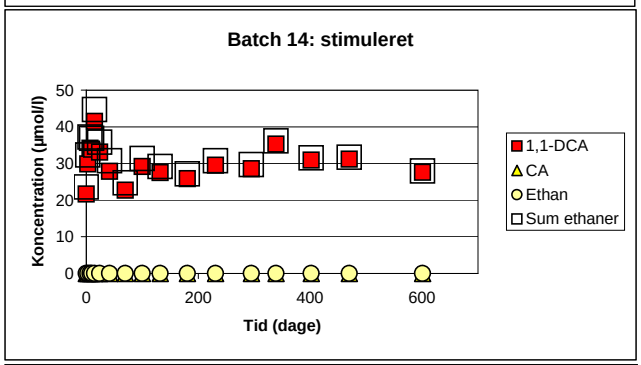


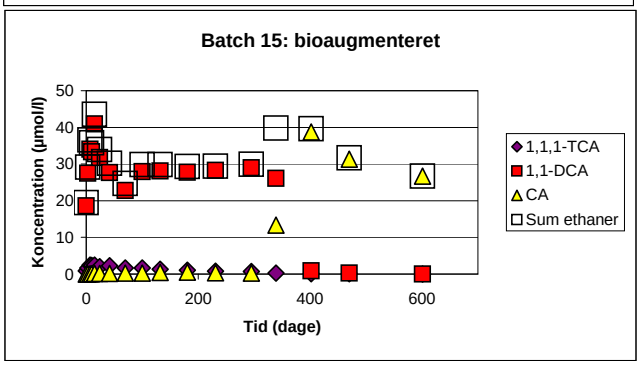


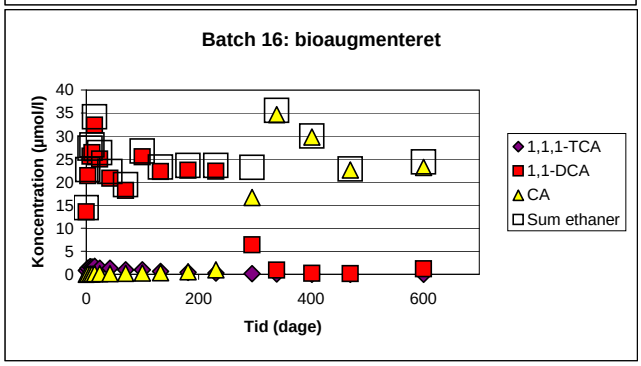






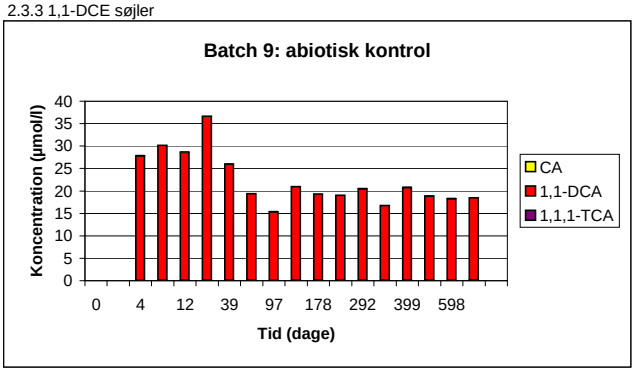


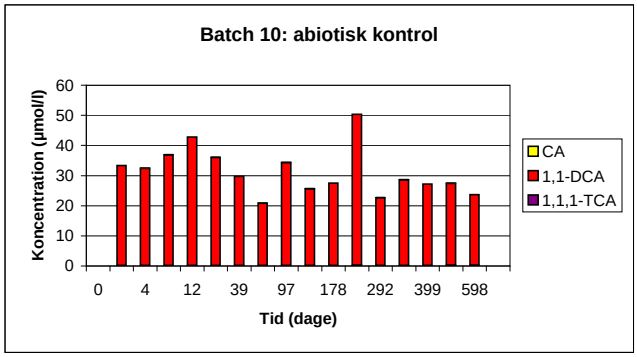


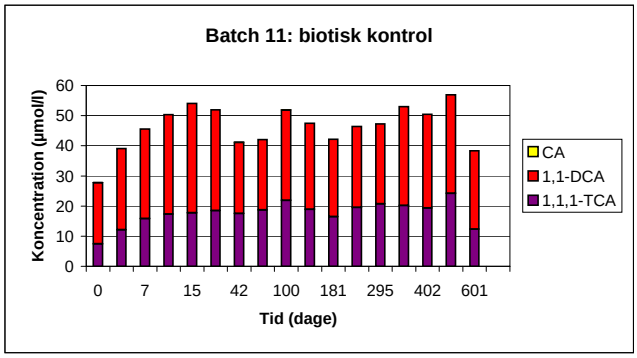


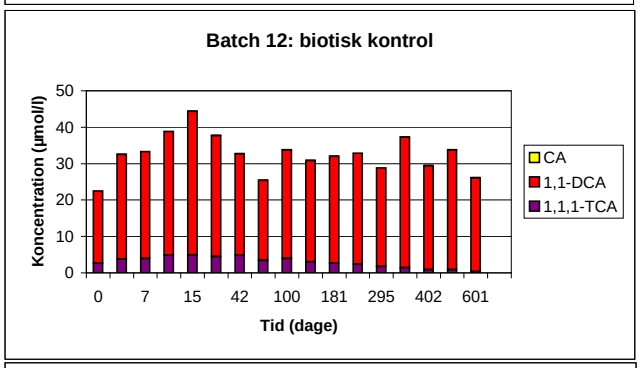
2.3 Høje Tåstrup Chlorerede ethaner

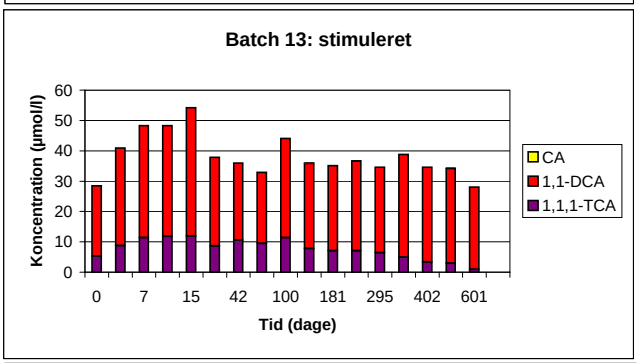
2.3.3 1,1-DCE søjler

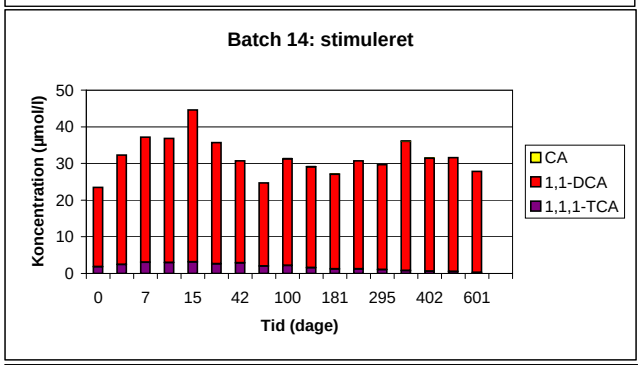


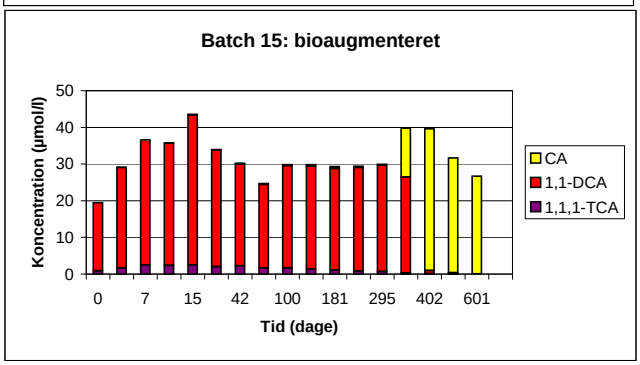


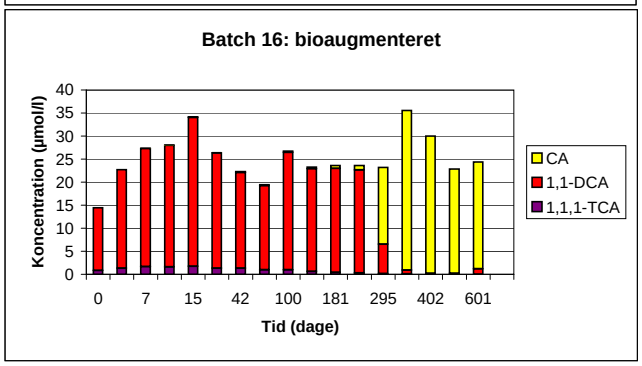






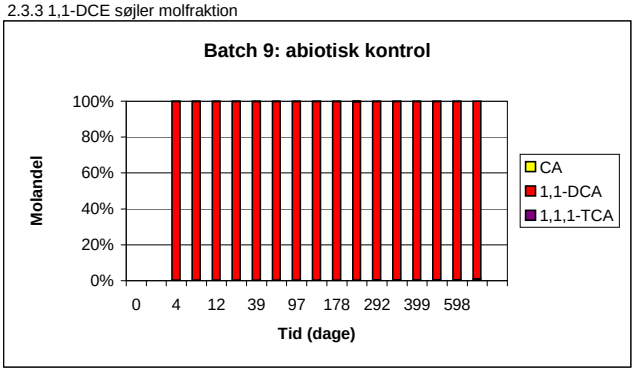


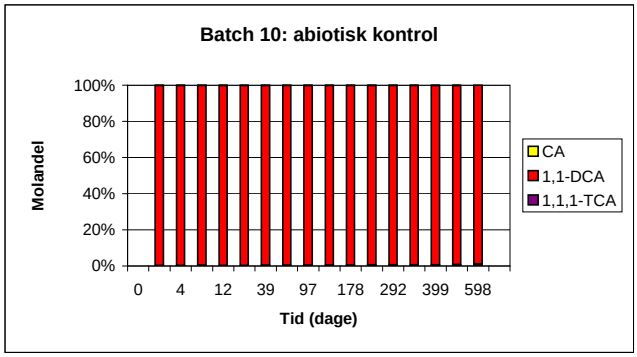


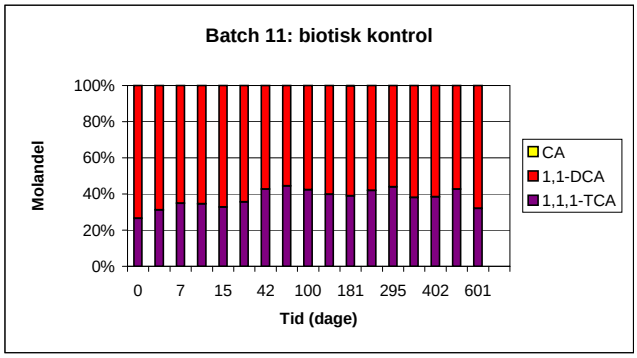


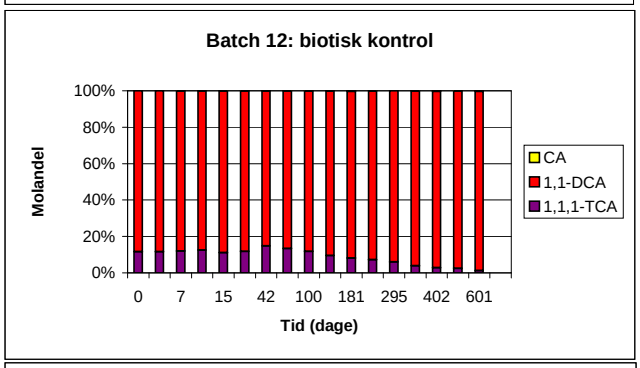
2.3 Høje Tåstrup Chlorerede ethaner

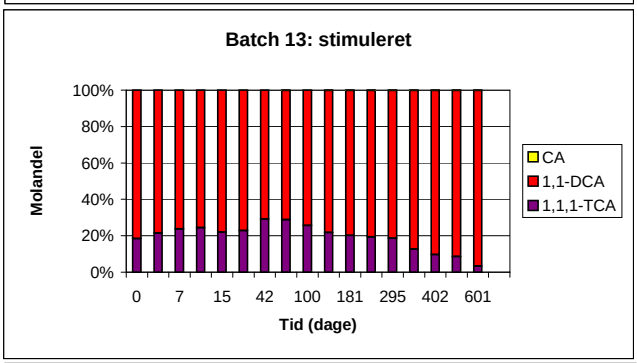
2.3.3 1,1-DCE søjler molfraktion

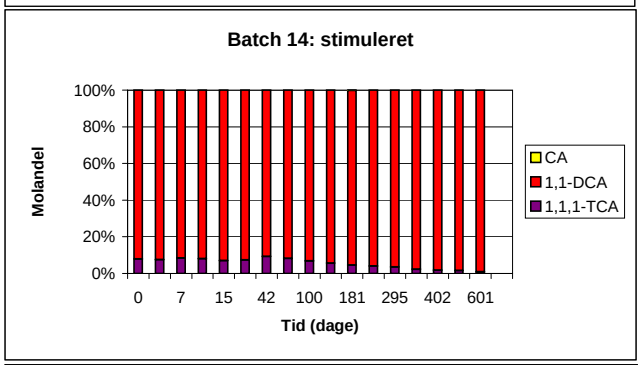


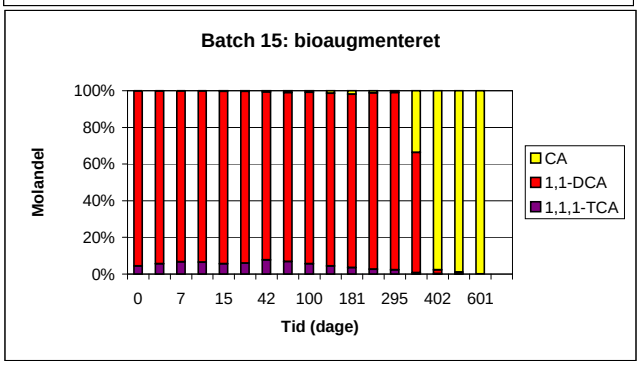


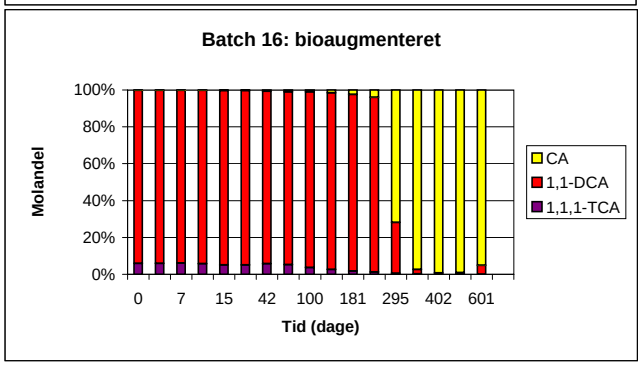






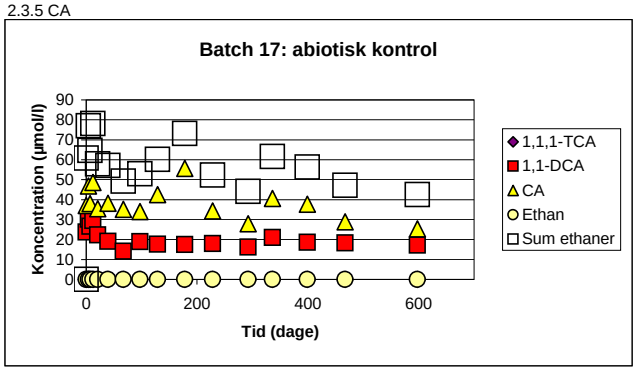


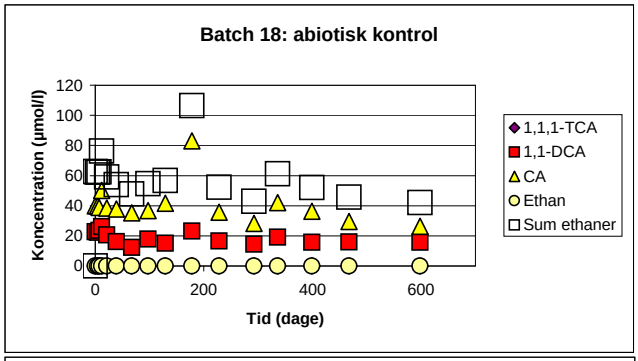


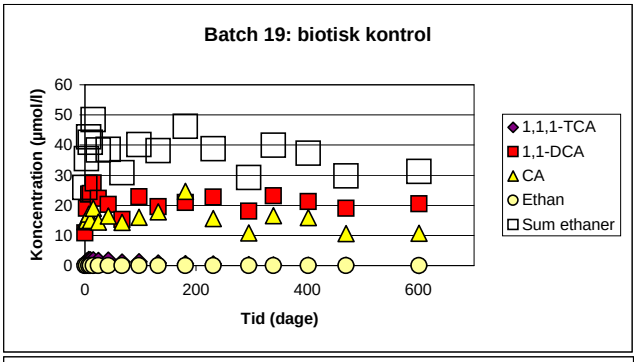


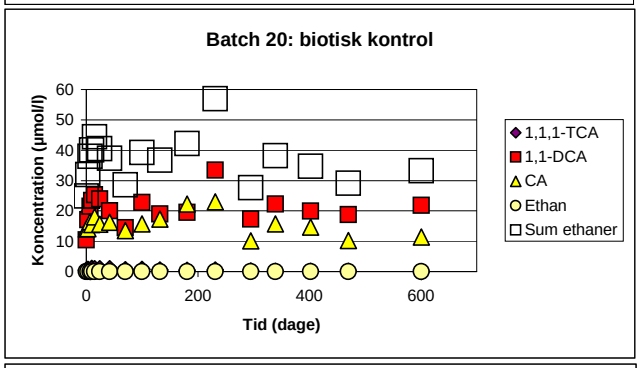
2.3 Høje Tåstrup Chlorerede ethaner

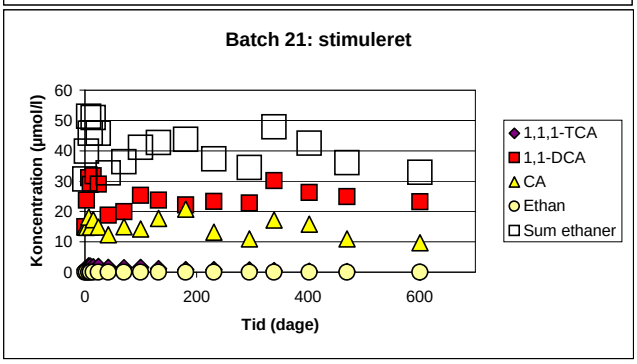
2.3.5 CA

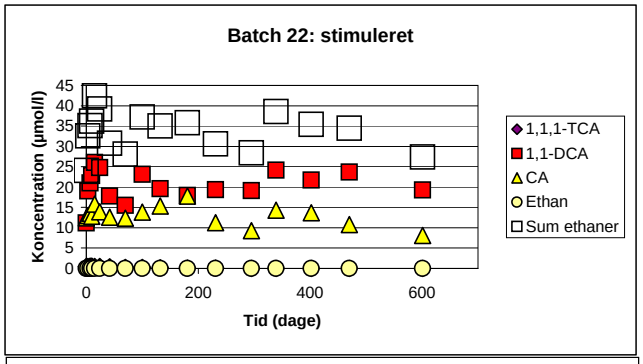


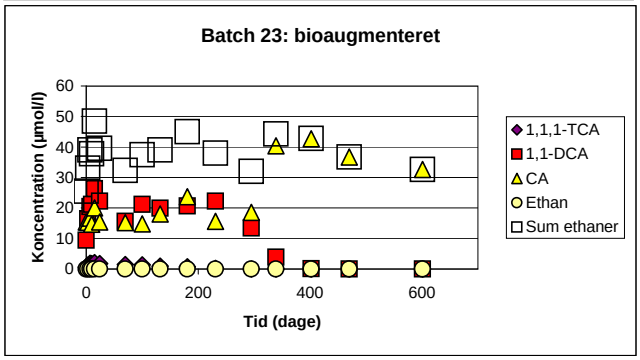


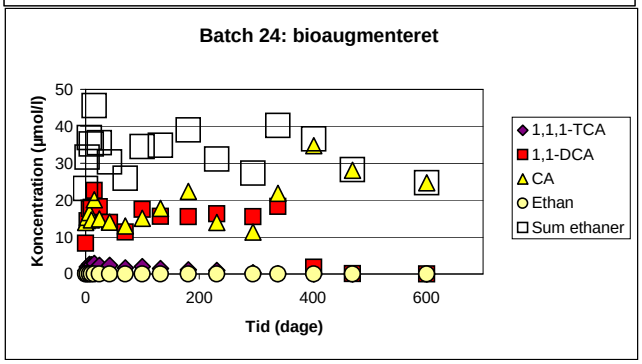






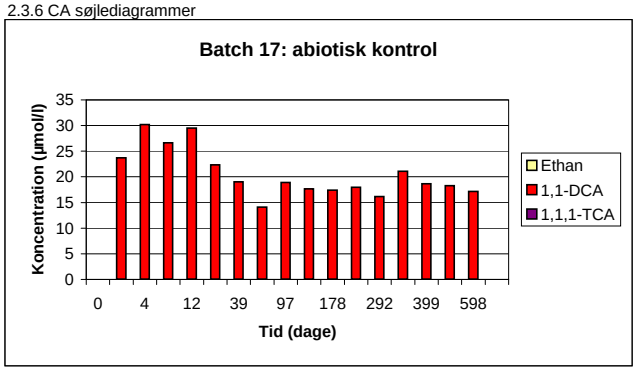


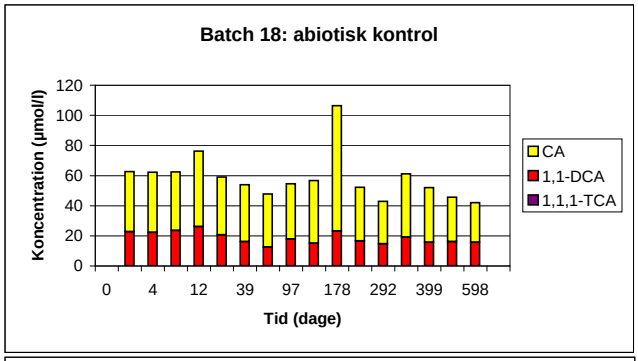


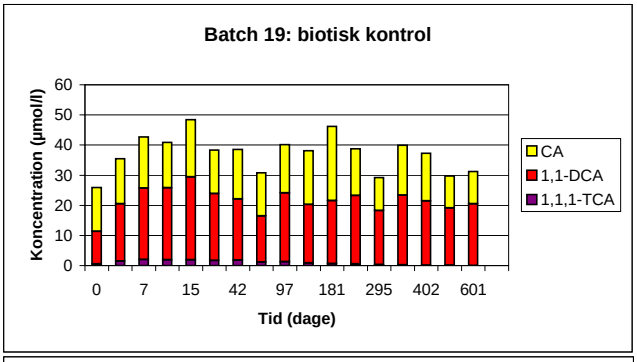


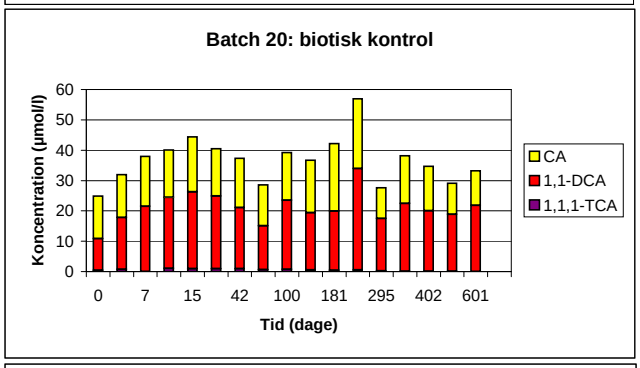
2.3 Høje Tåstrup Chlorerede ethaner

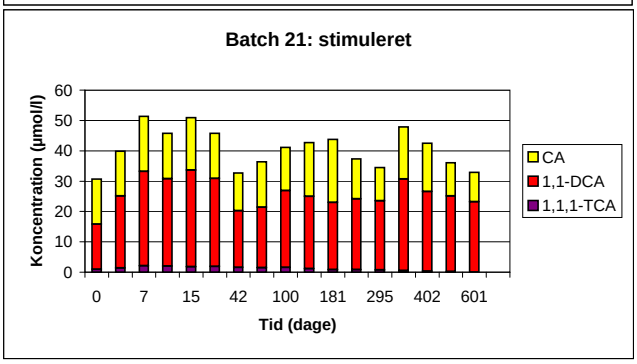
2.3.6 CA søjlediagrammer

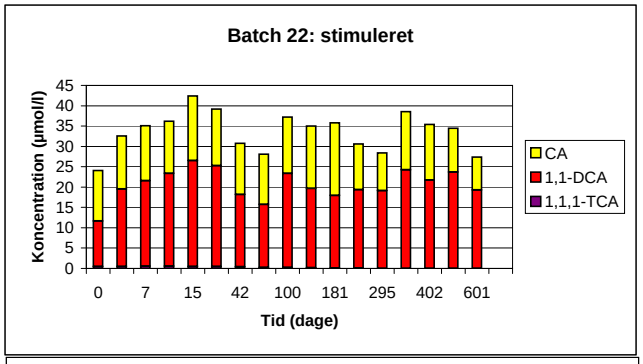


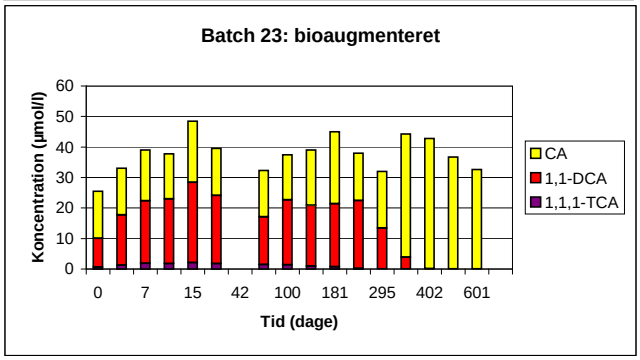


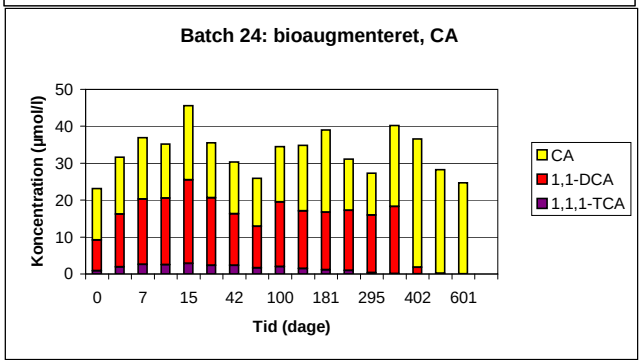






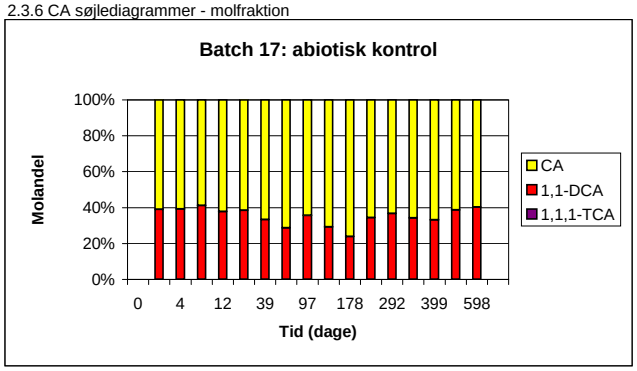


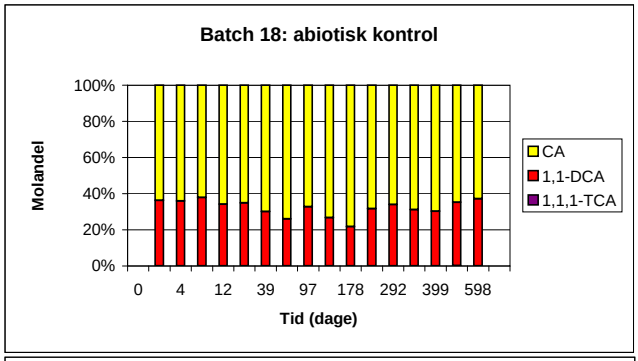


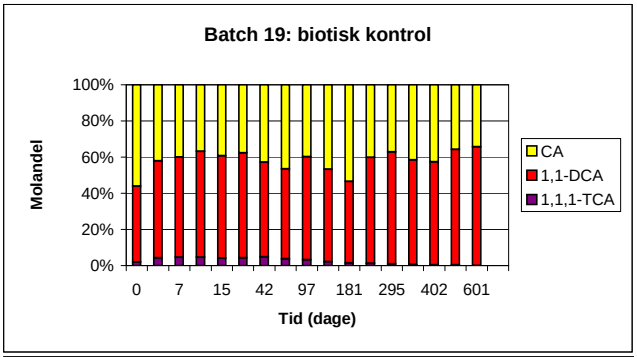


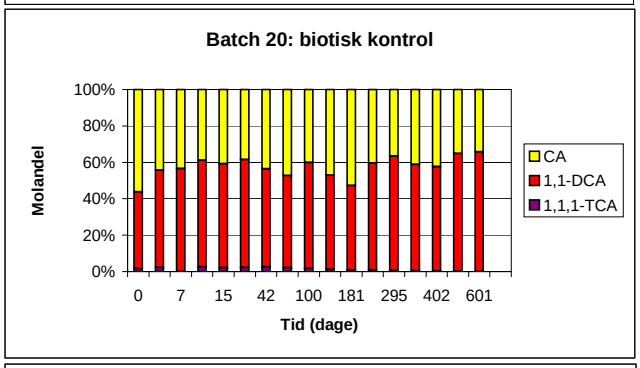
2.3 Høje Tåstrup Chlorerede ethaner

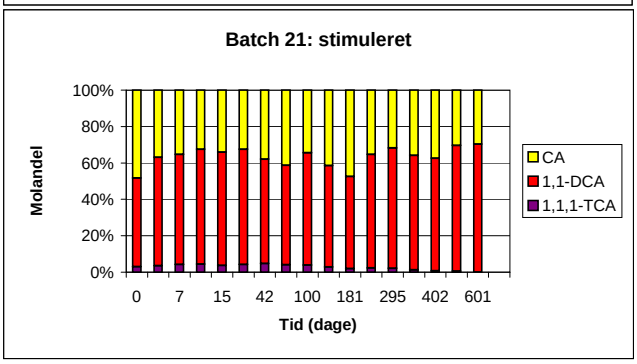
2.3.6 CA søjlediagrammer - molfraktion

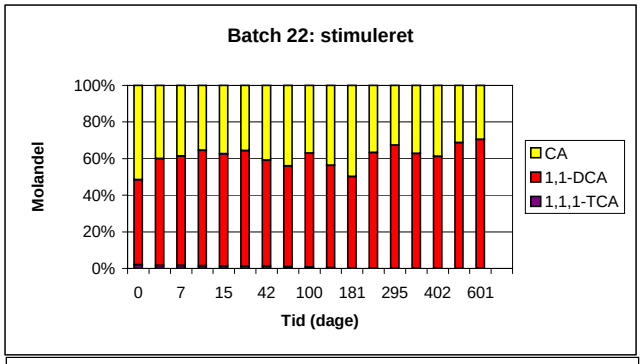


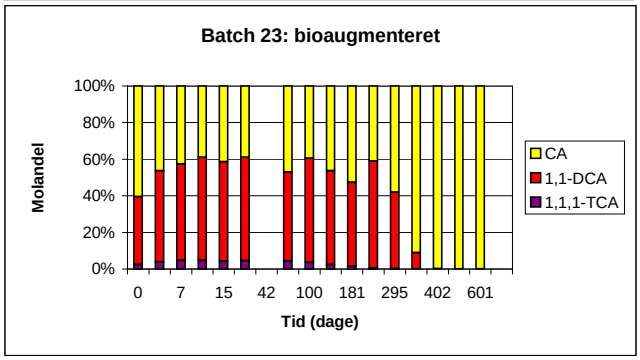


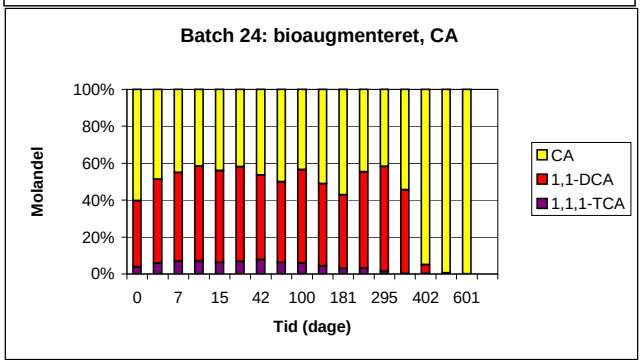






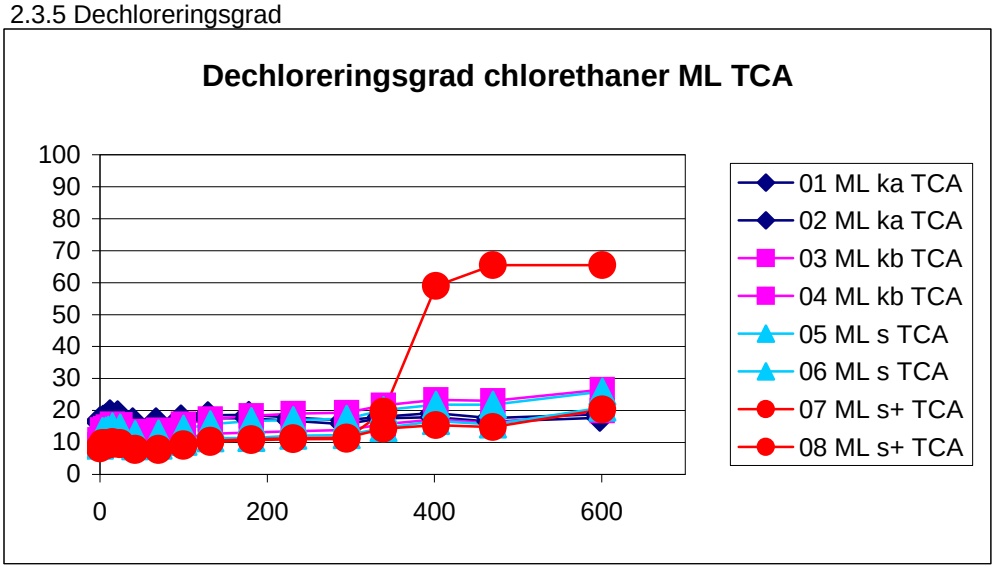


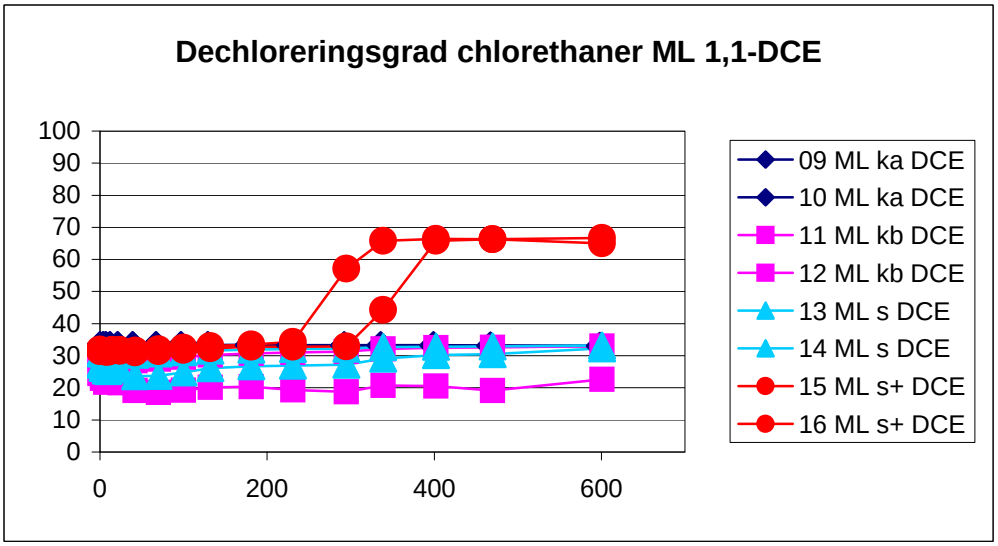


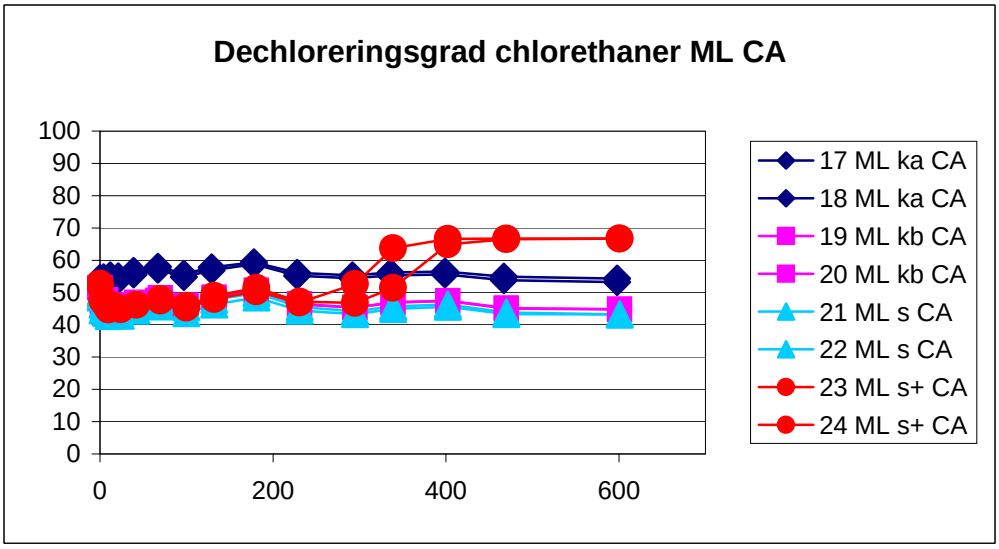


2.3 Høje Tåstrup Chlorerede ethaner

2.3.5 Dechloreringsgrad

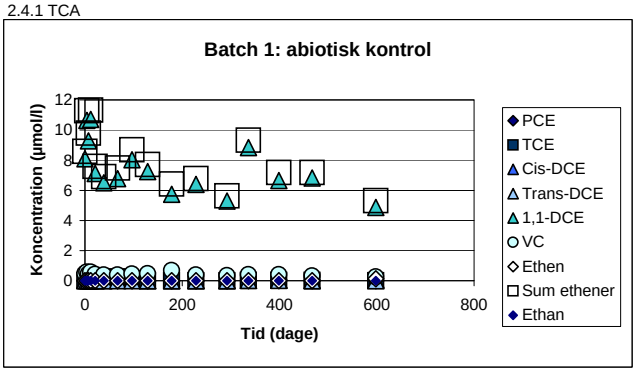


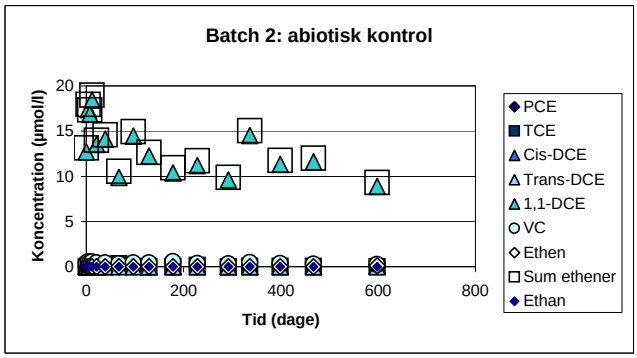


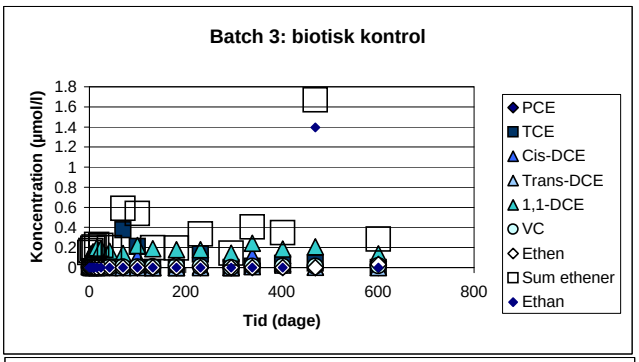


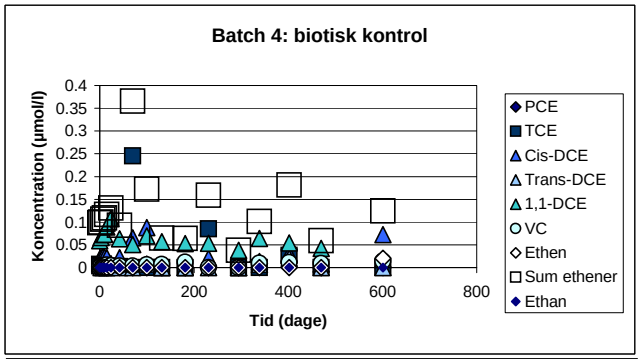
2.4 Høje Tåstrup Chlorerede ethener

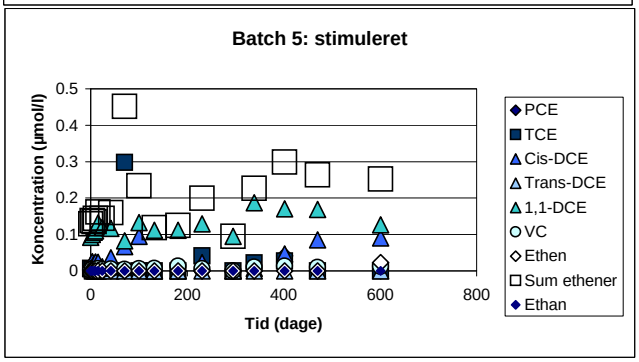
2.4.1 TCA

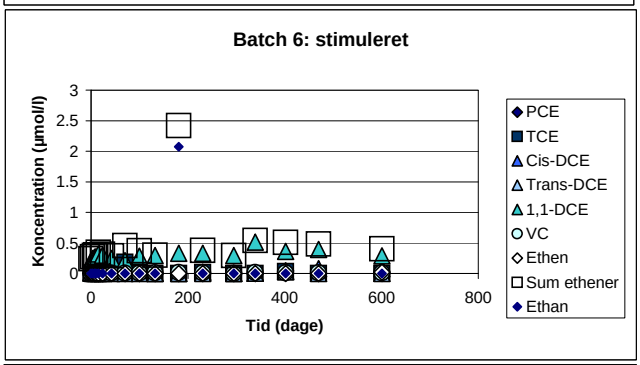


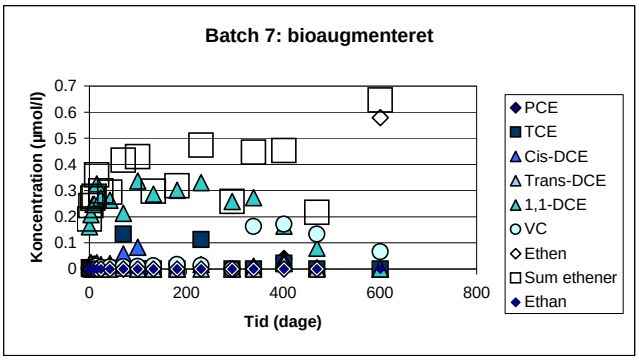


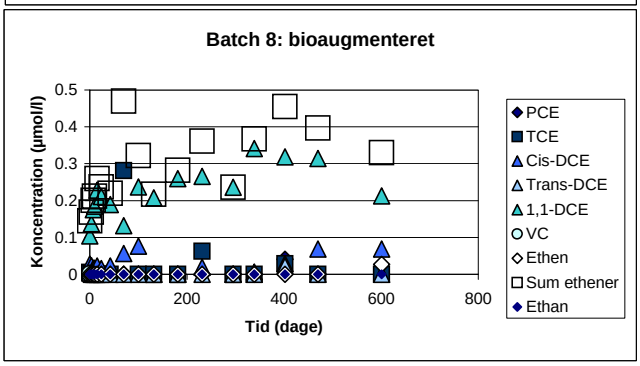






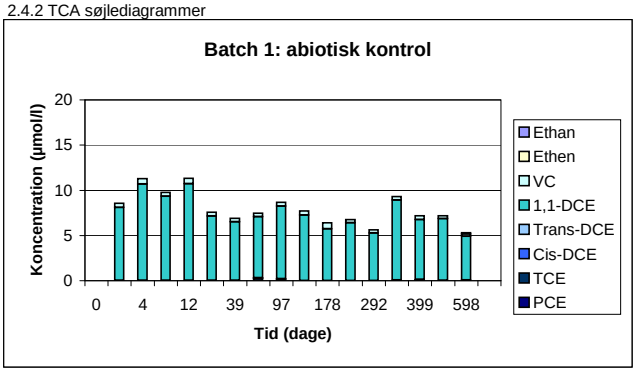


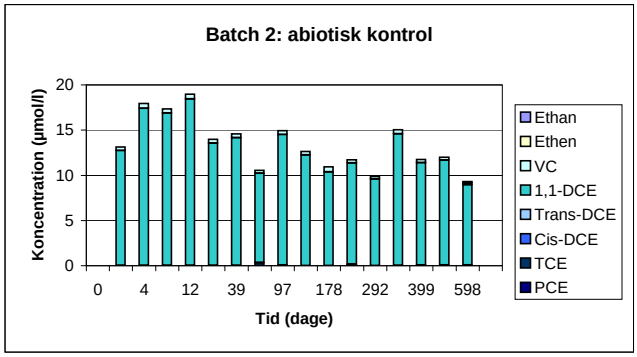


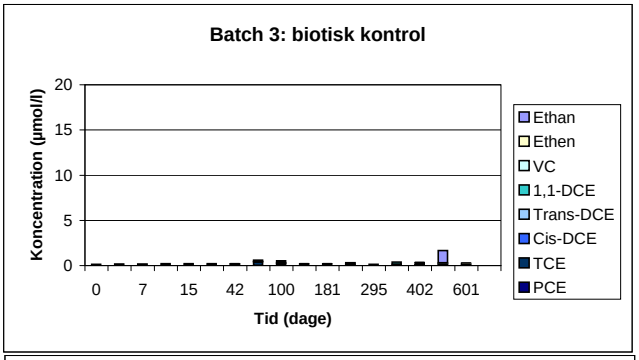


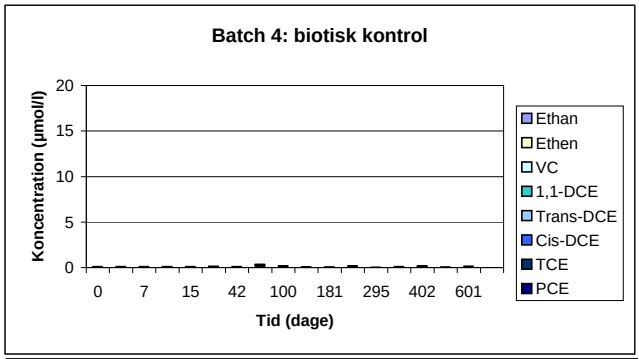
2.4 Høje Tåstrup Chlorerede ethener

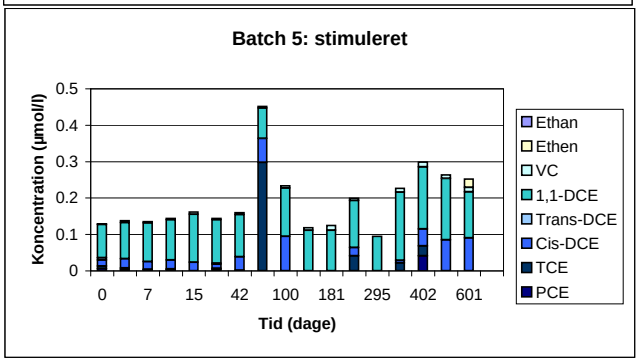
2.4.2 TCA søjlediagrammer

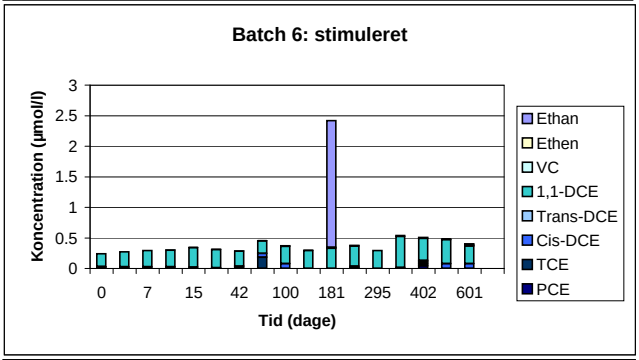


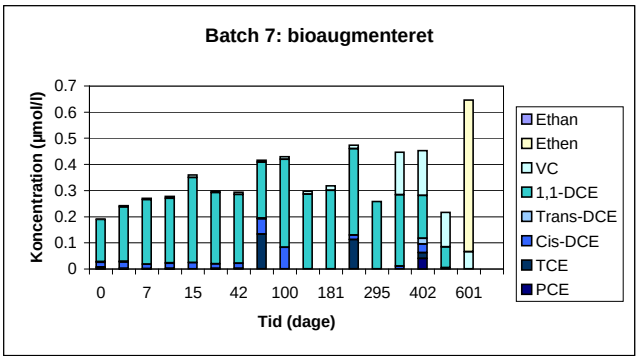


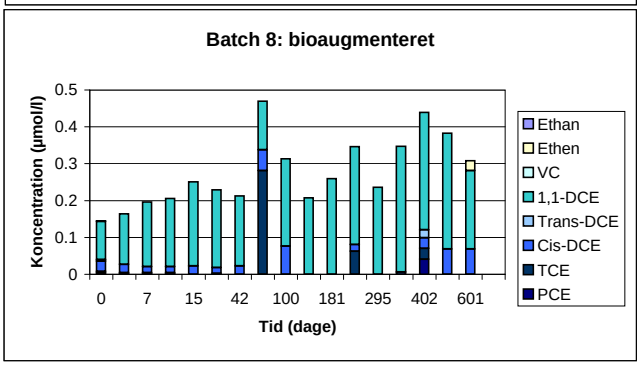






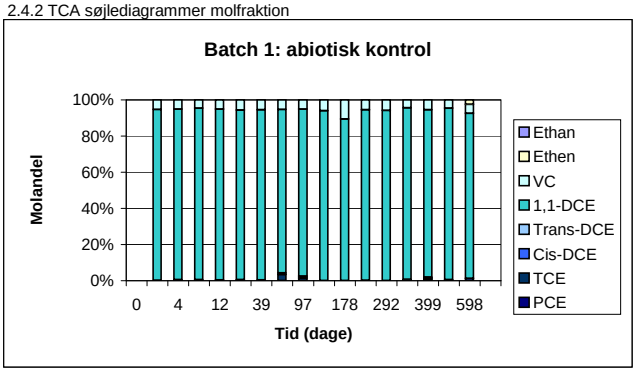


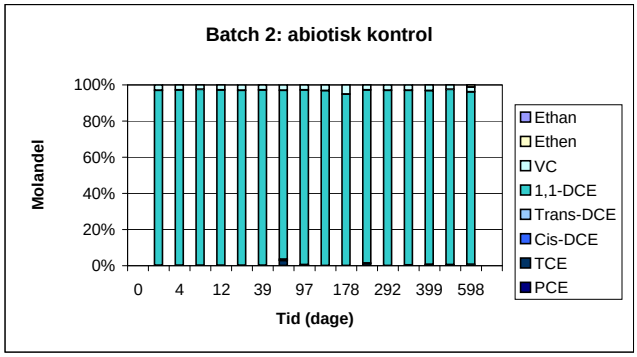


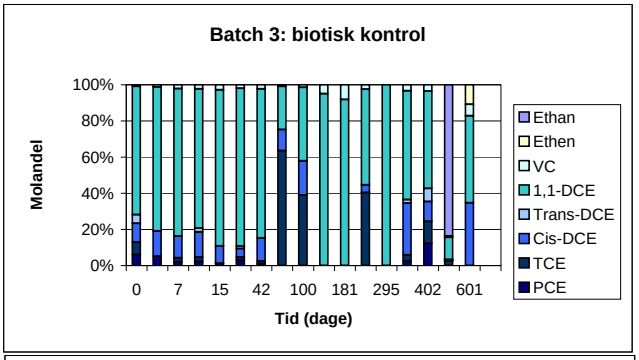


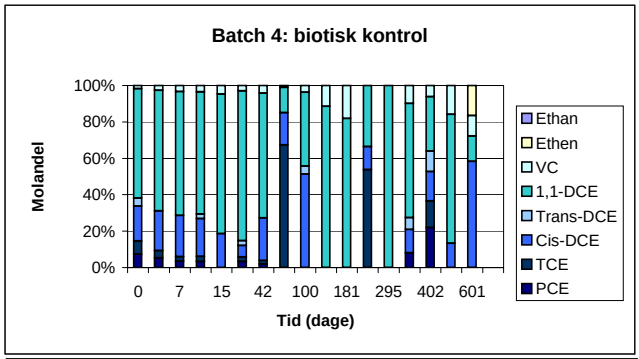
2.4 Høje Tåstrup Chlorerede ethener

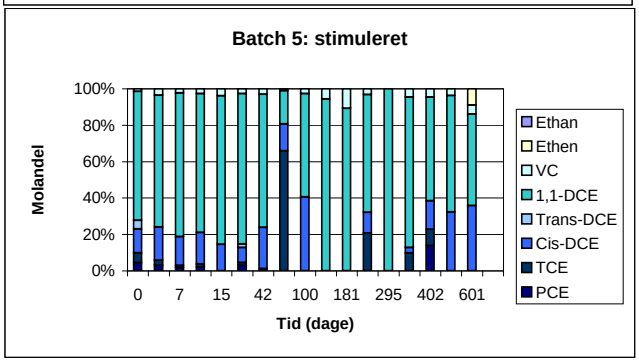
2.4.2 TCA søjlediagrammer molfraktion

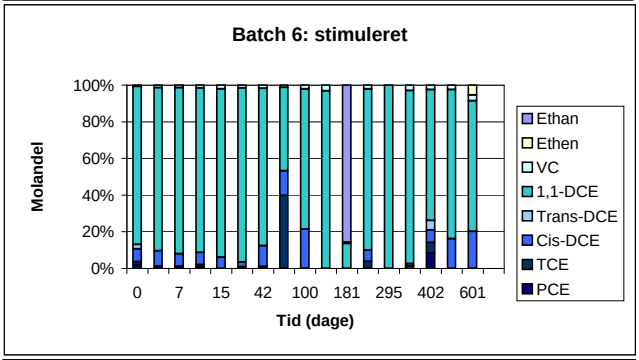


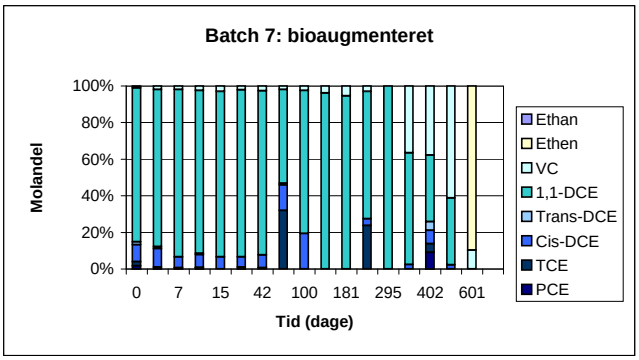


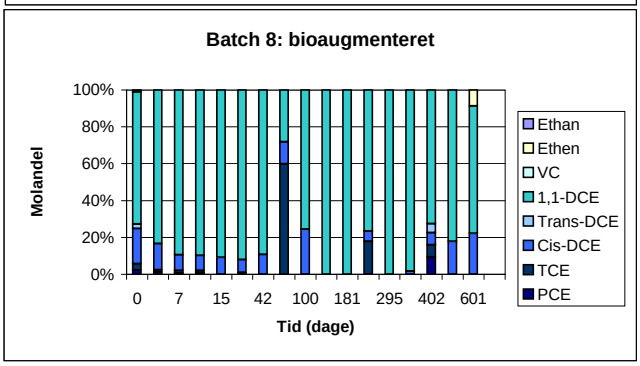






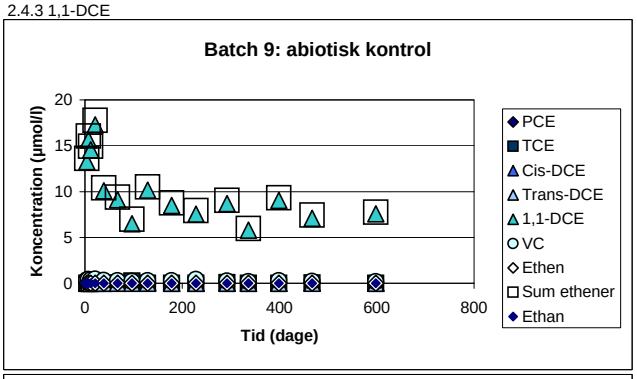


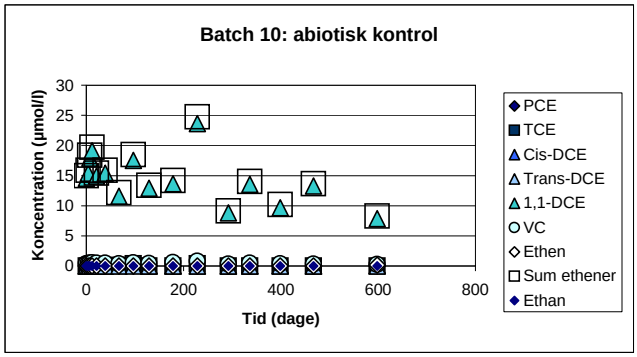


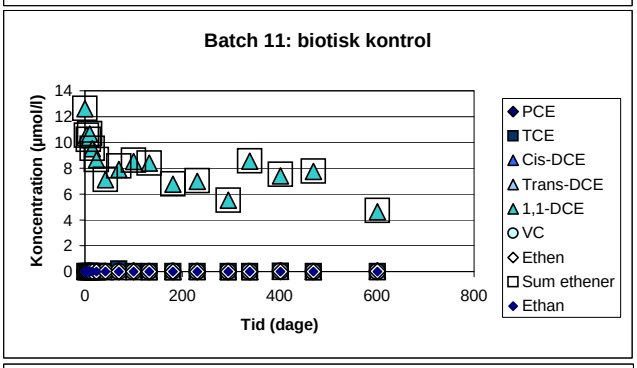


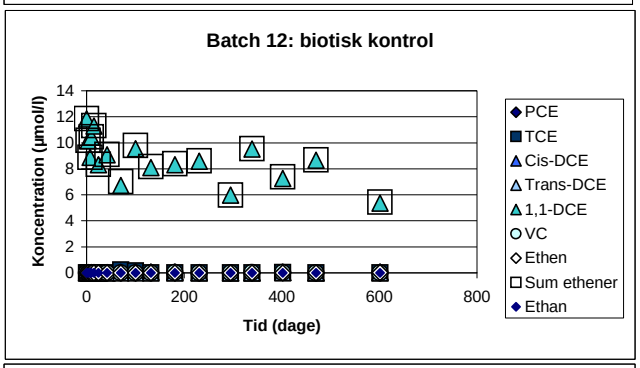
2.4 Høje Tåstrup Chlorerede ethener

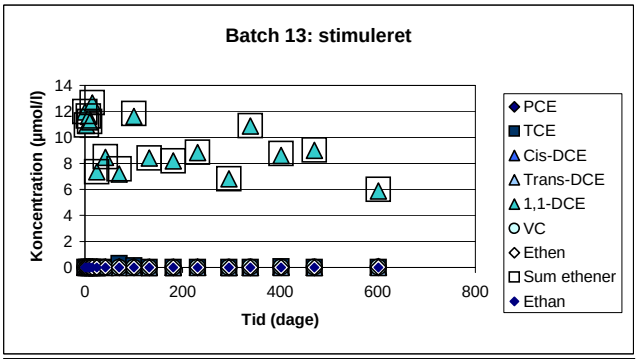
2.4.3 1,1-DCE

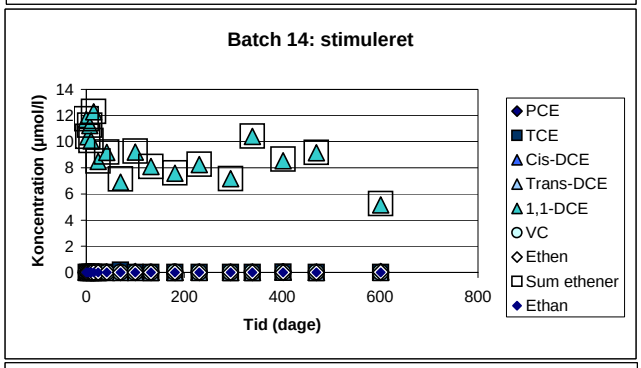


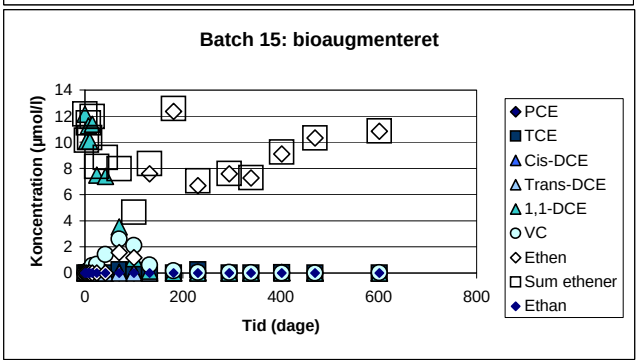


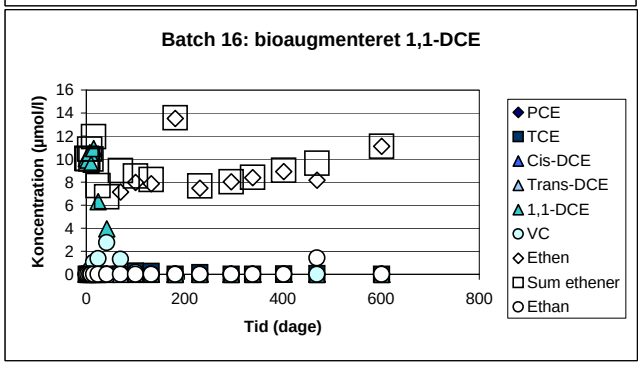






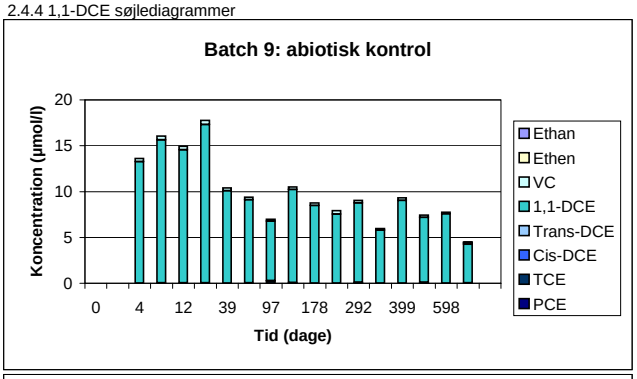


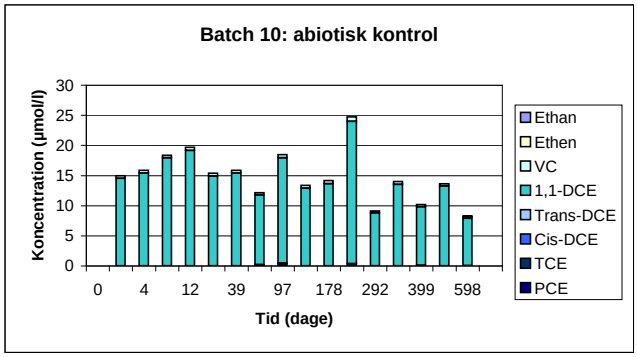


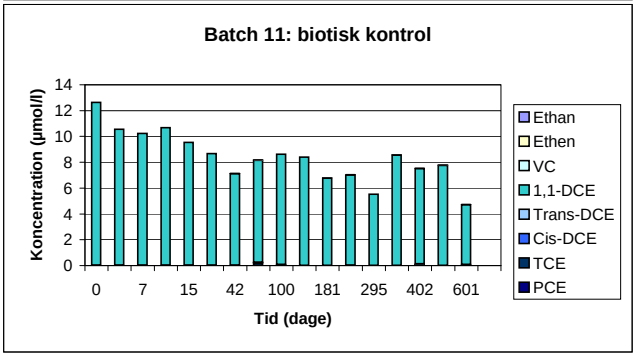


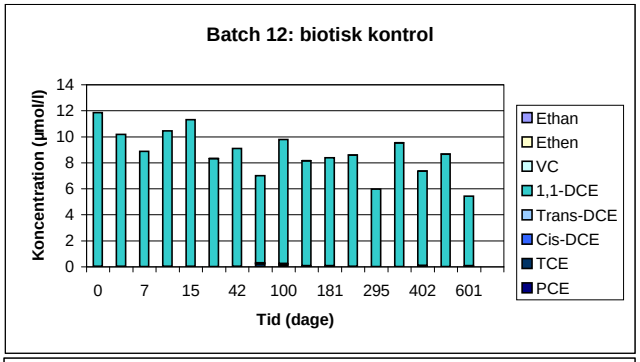
2.4 Høje Tåstrup Chlorerede ethener

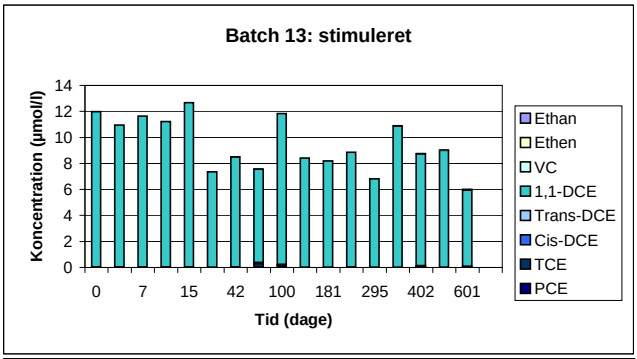
2.4.4 1,1-DCE søjlediagrammer

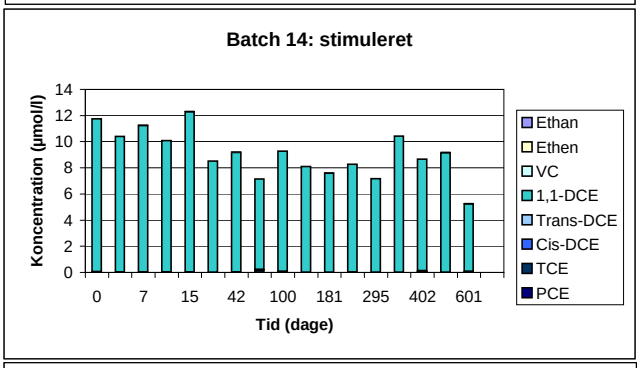


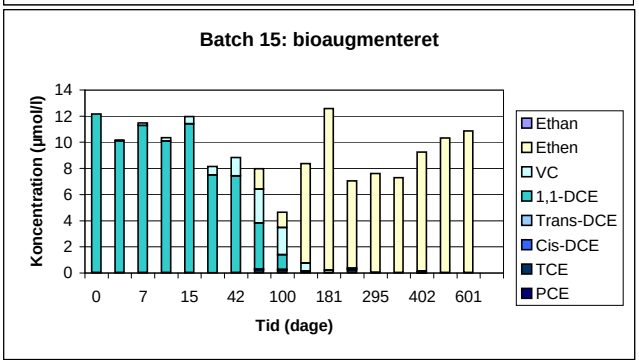


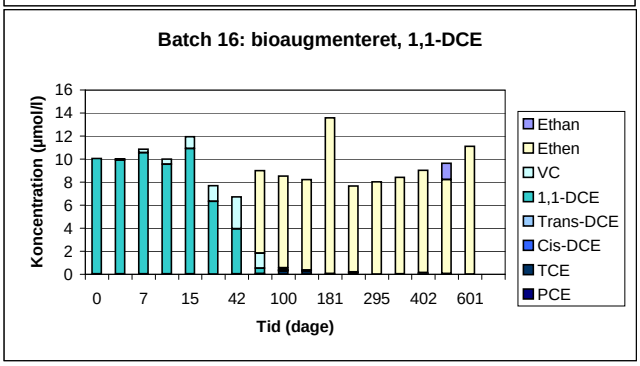






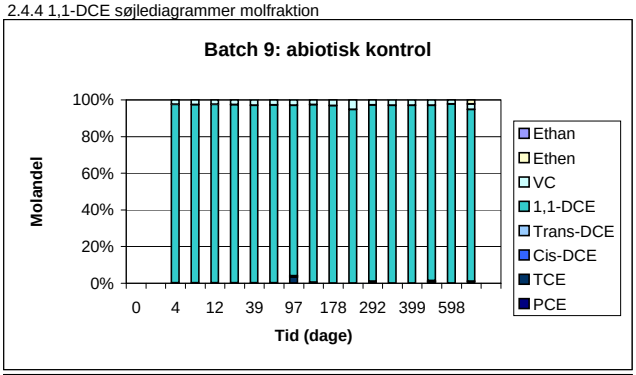


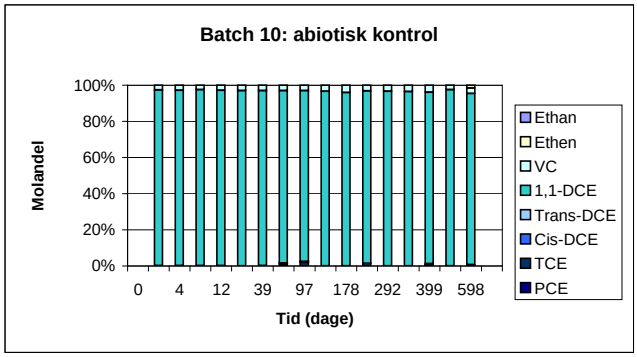


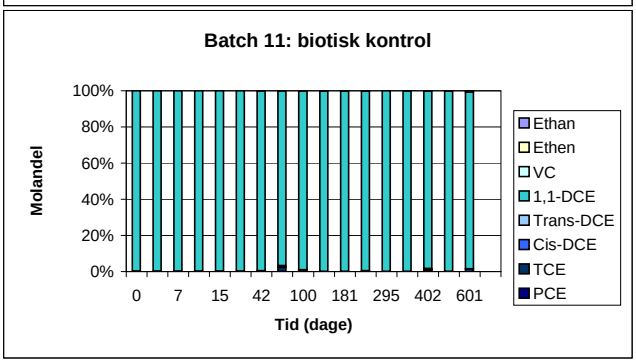


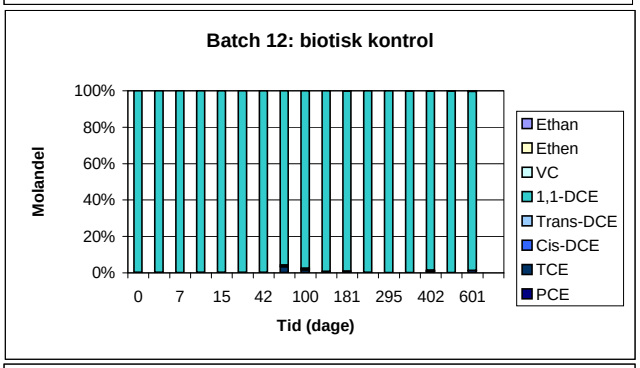
2.4 Høje Tåstrup Chlorerede ethener

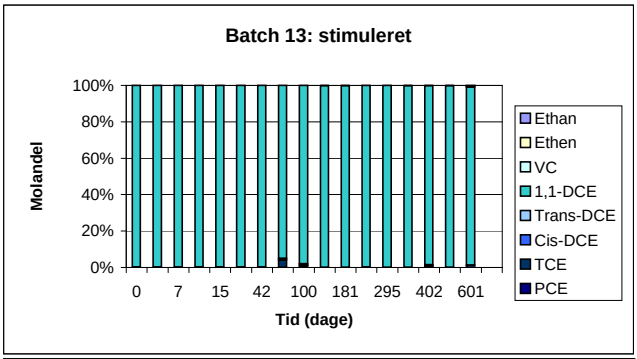
2.4.4 1,1-DCE søjlediagrammer molfraktion

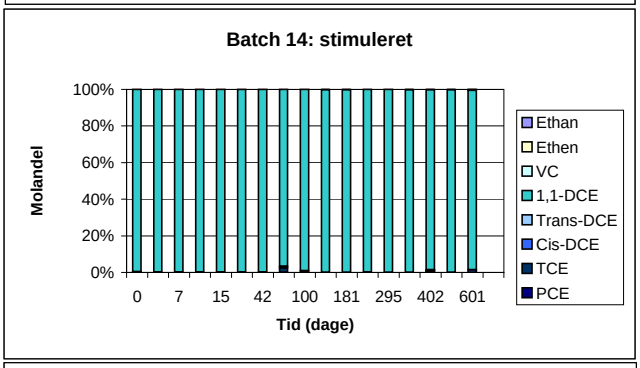


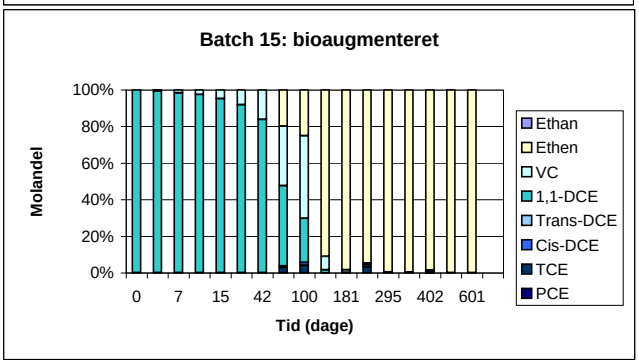


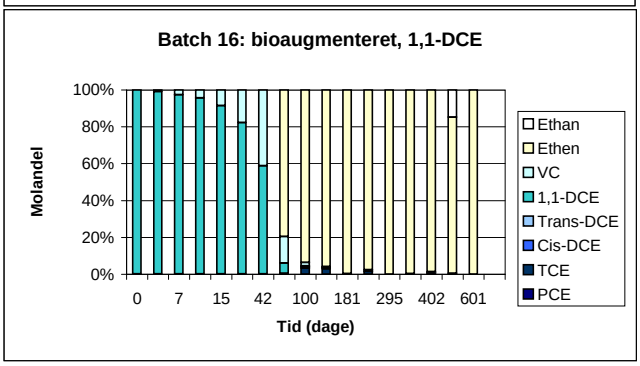






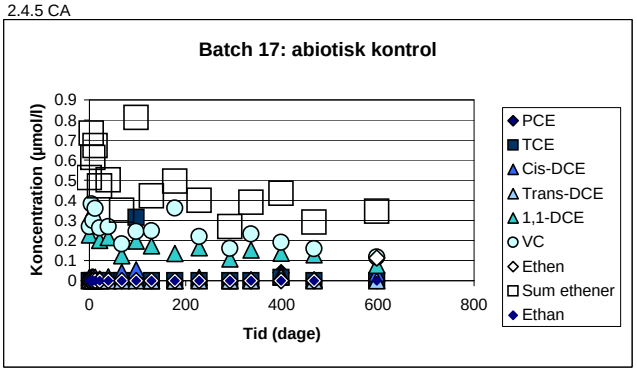


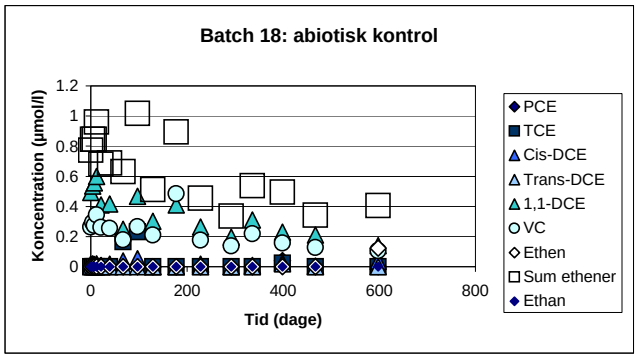


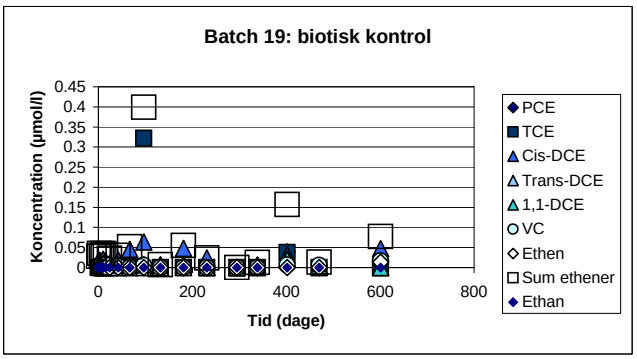


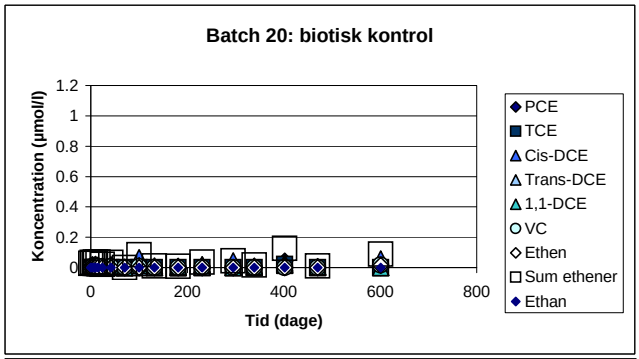
2.4 Høje Tåstrup Chlorerede ethener

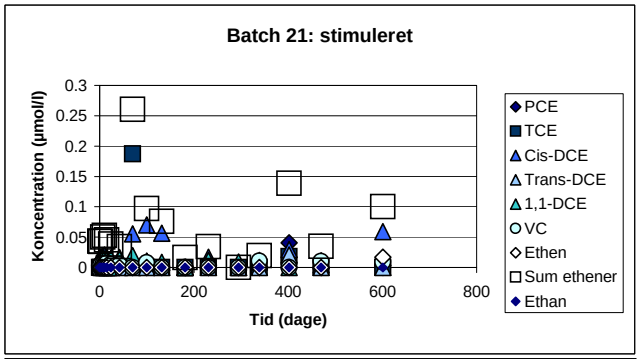
2.4.5 CA

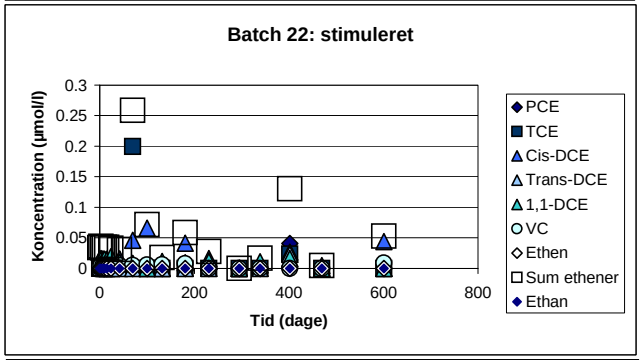


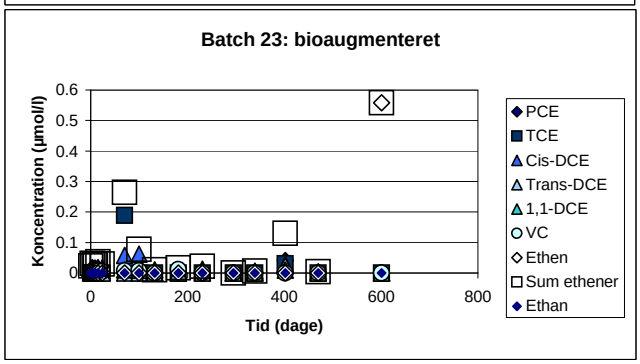


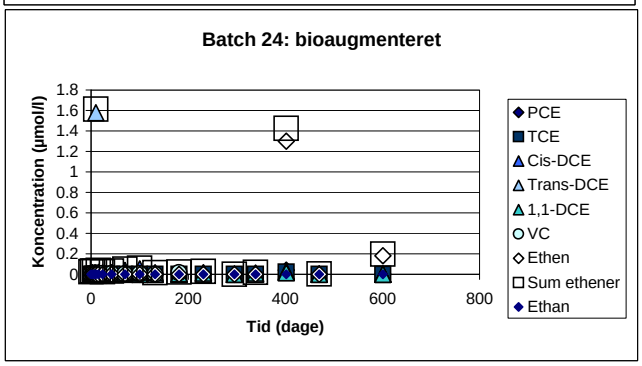






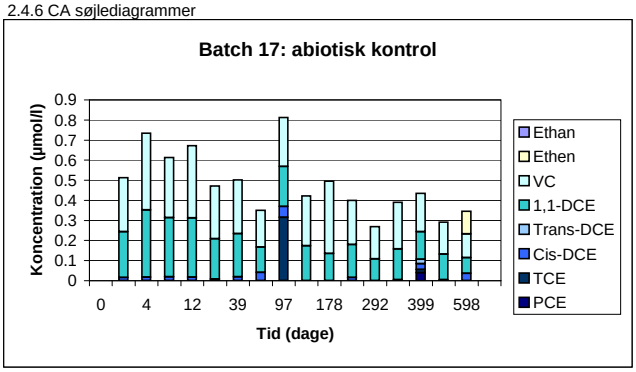


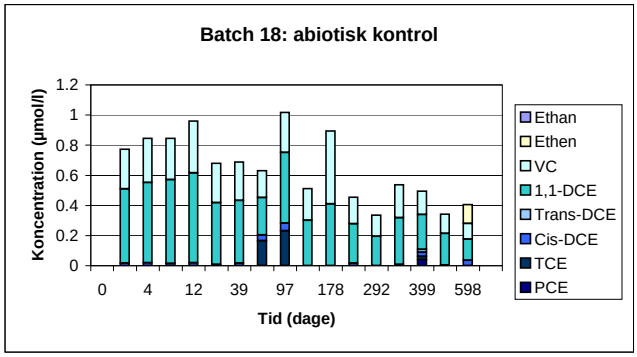


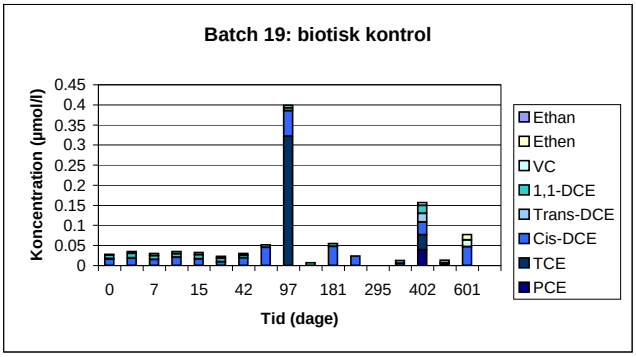


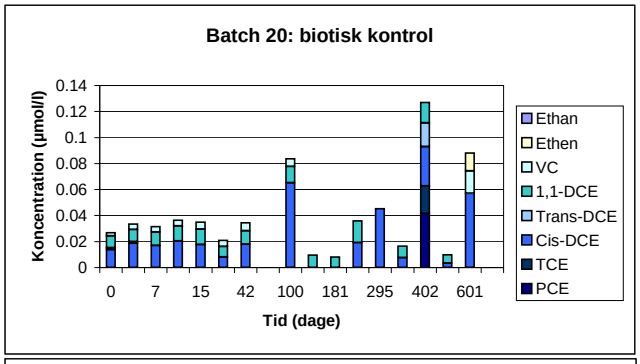
2.4 Høje Tåstrup Chlorerede ethener

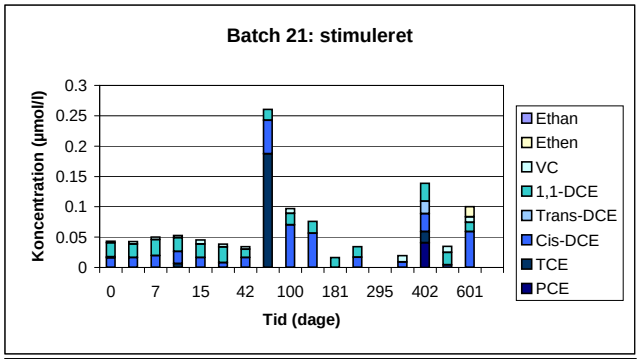
2.4.6 CA søjlediagrammer

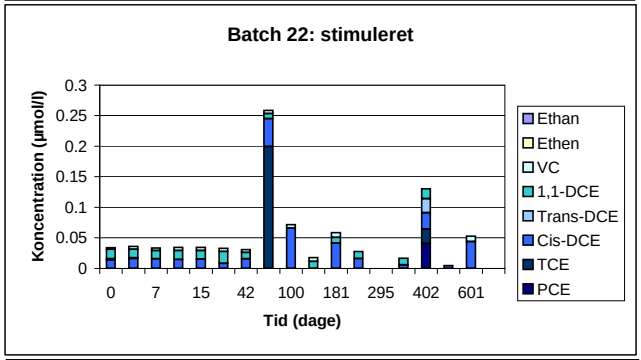


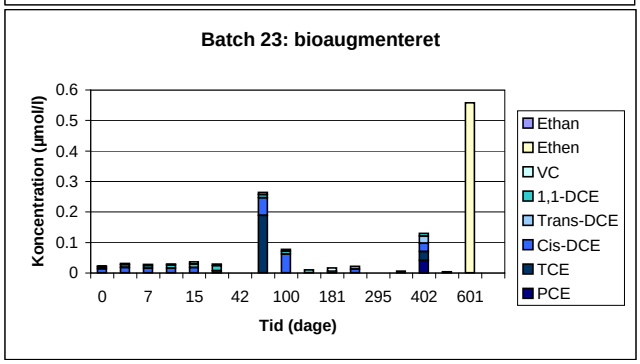


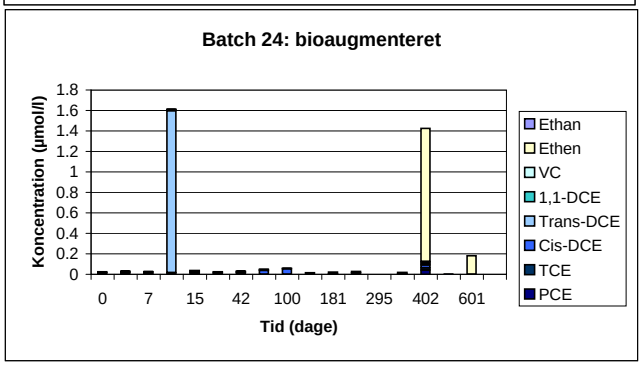






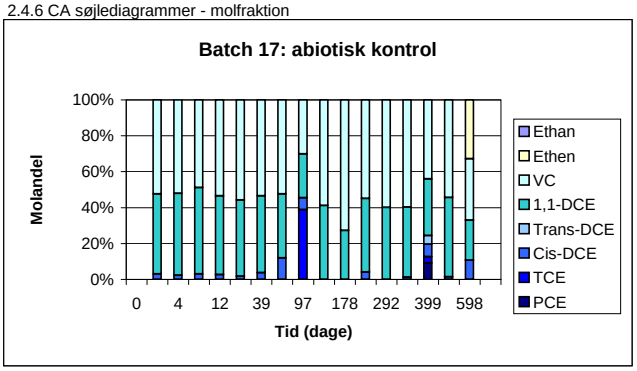


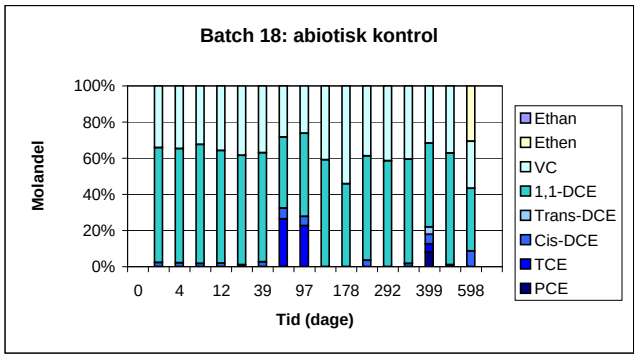


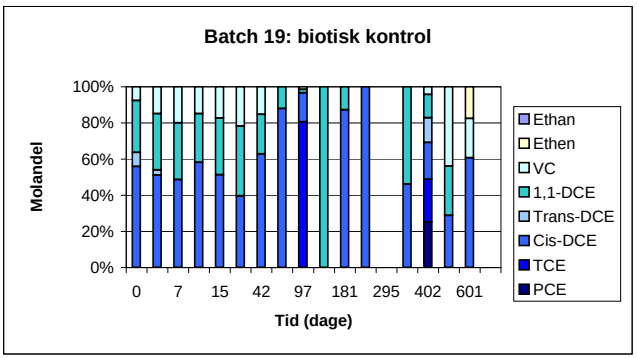


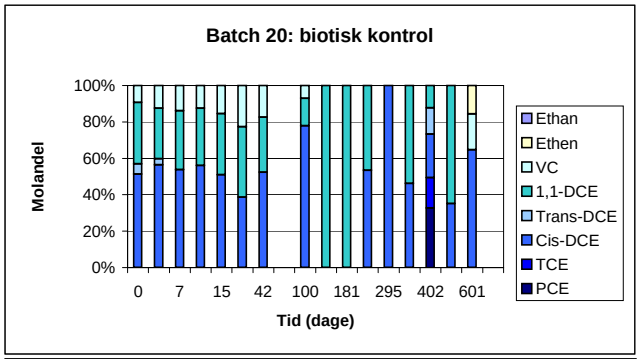
2.4 Høje Tåstrup Chlorerede ethener

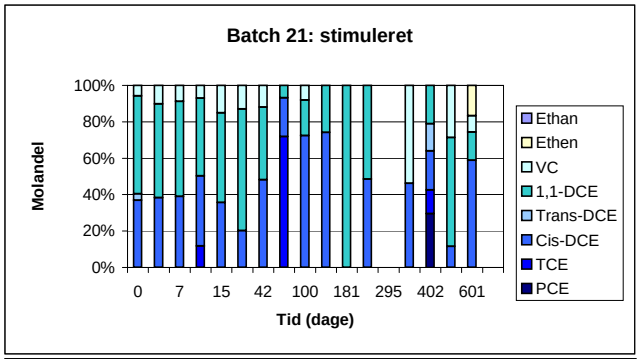
2.4.6 CA søjlediagrammer - molfraktion

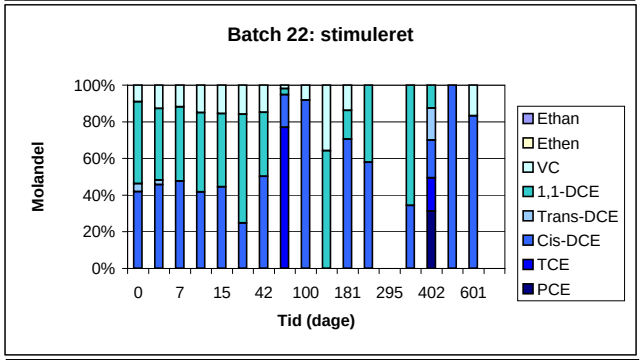


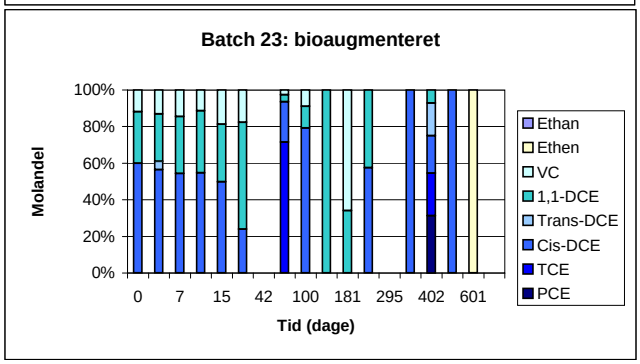


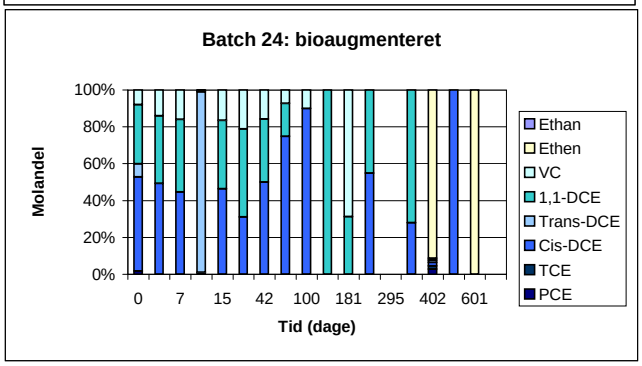






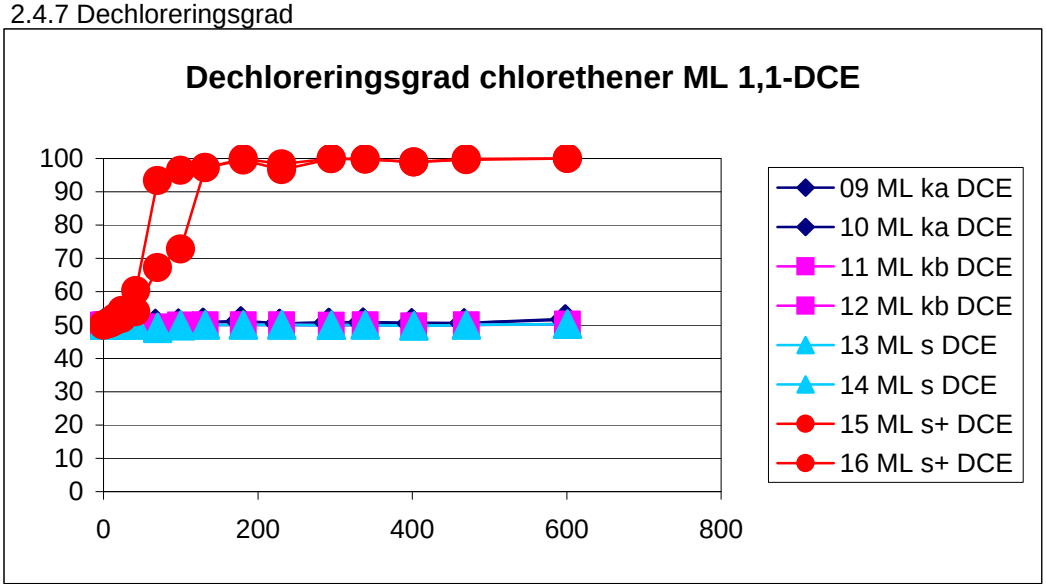






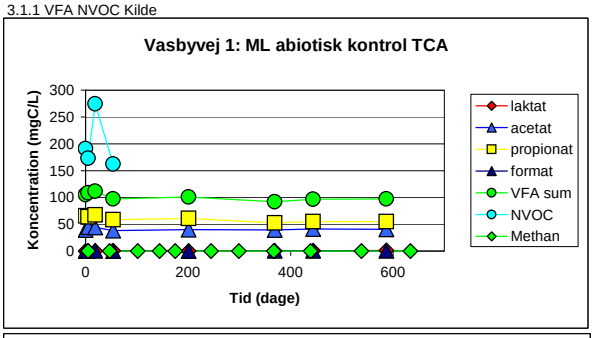
2.4 Høje Tåstrup Chlorerede ethener

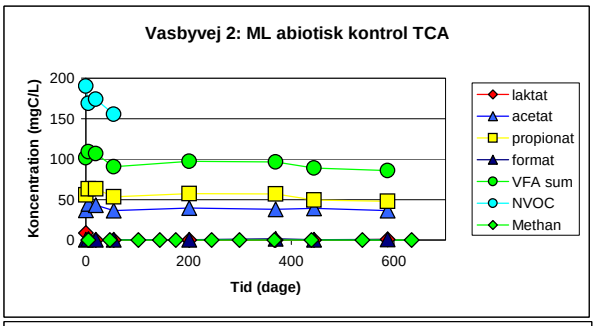
2.4.7 Dechloreringsgrad

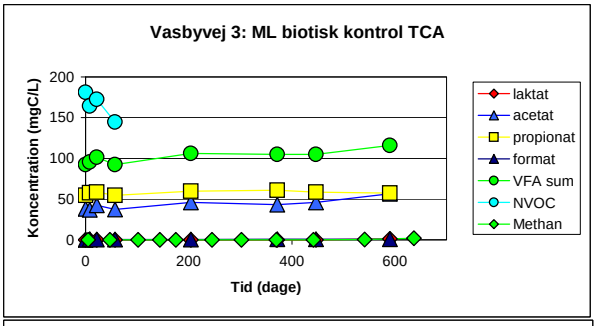


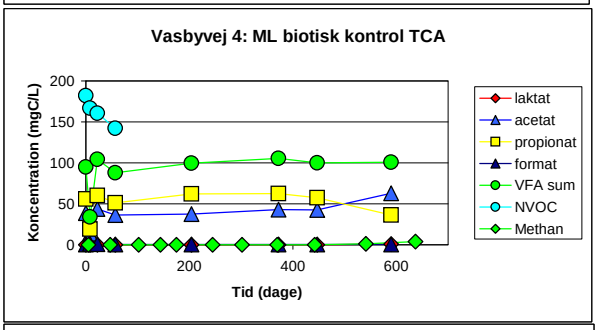
3.1 Vasbyvej Donor

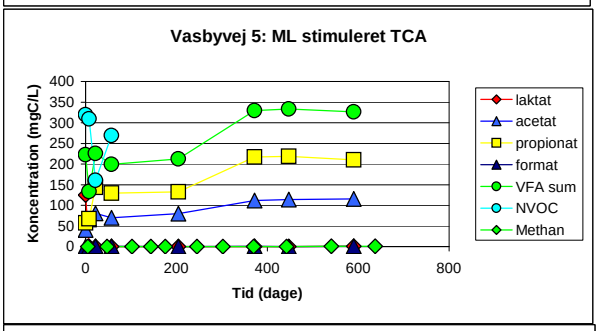
3.1.1 VFA NVOC Kilde

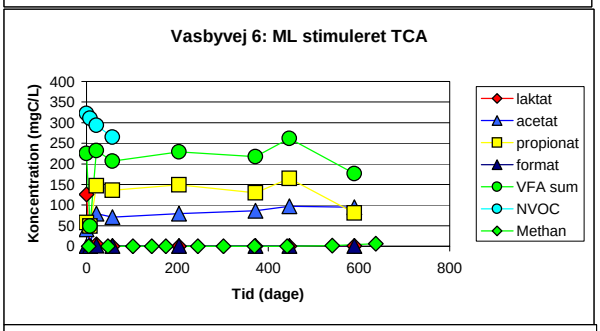


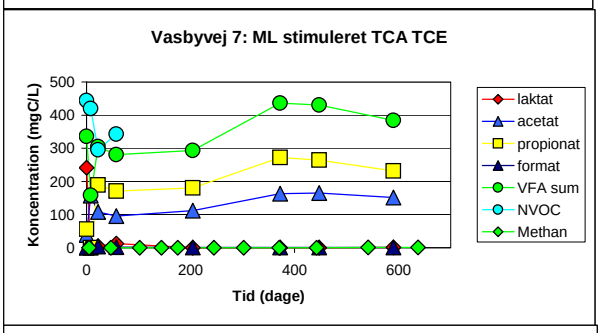


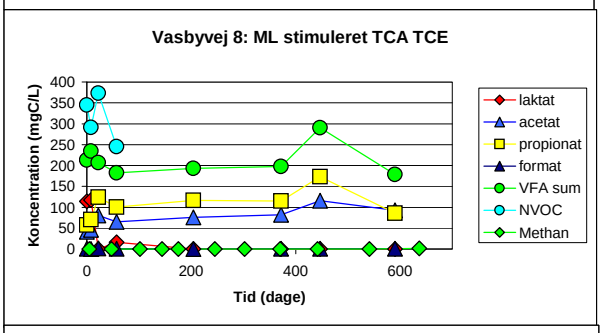


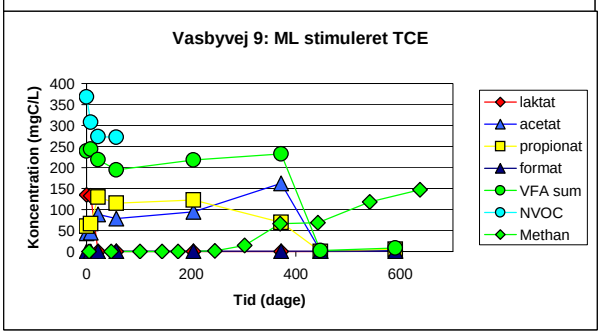


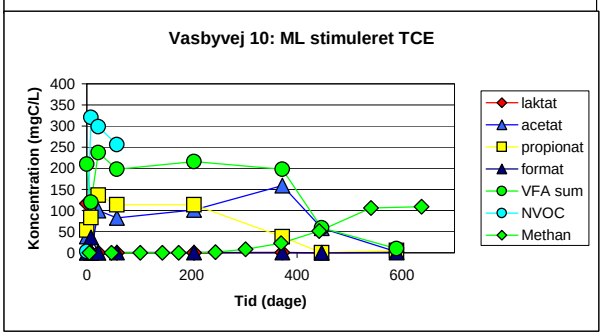




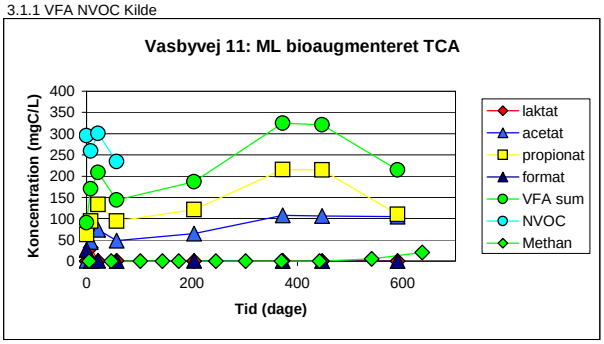


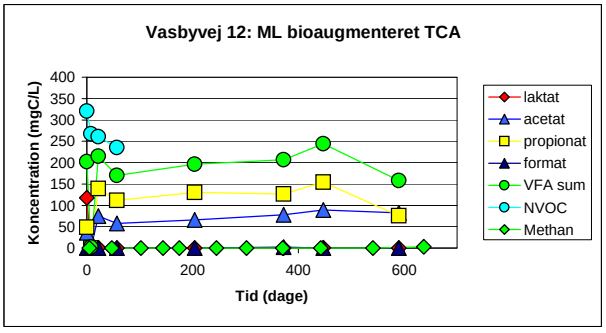


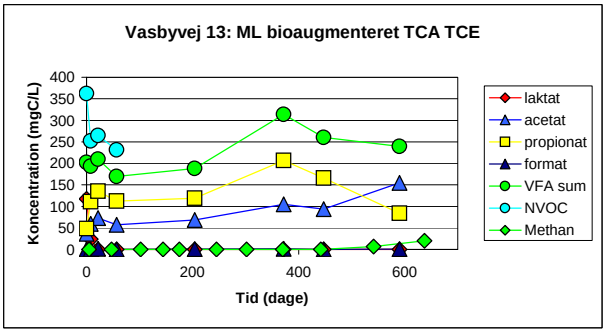


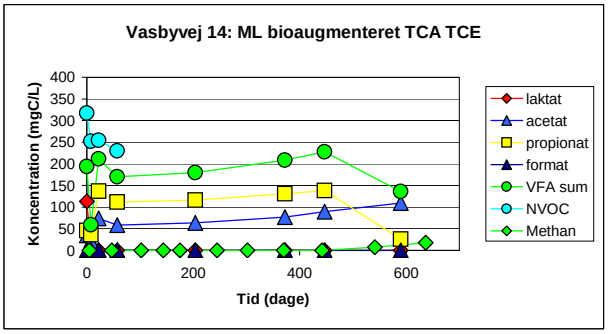


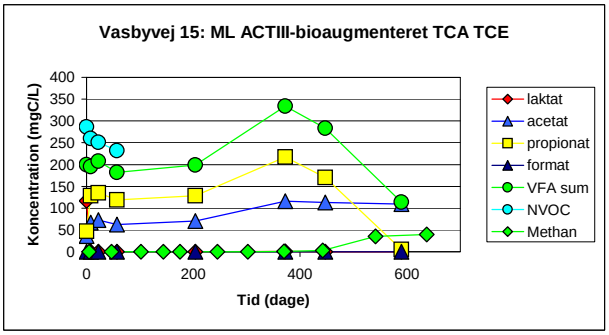
3.1.1 VFA NVOC Kilde

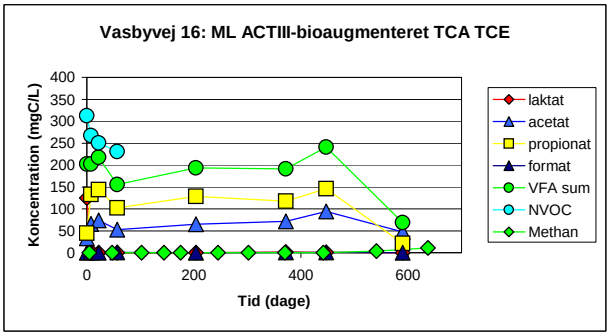


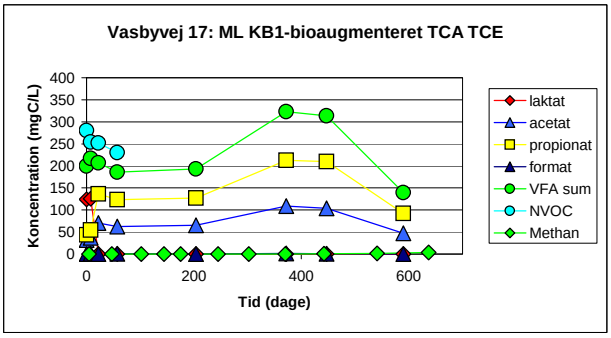


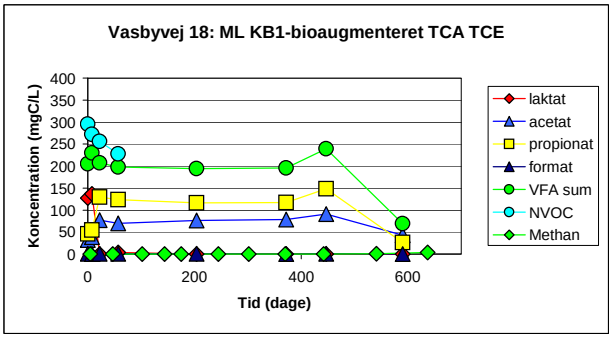


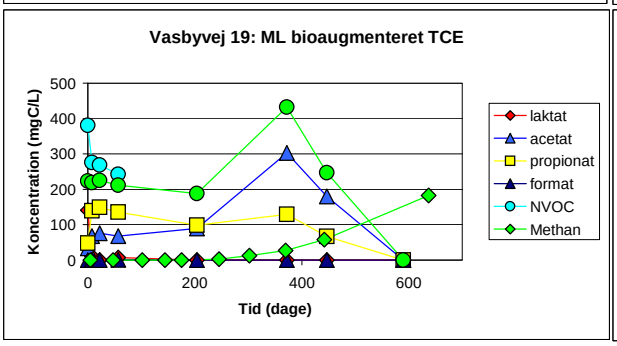


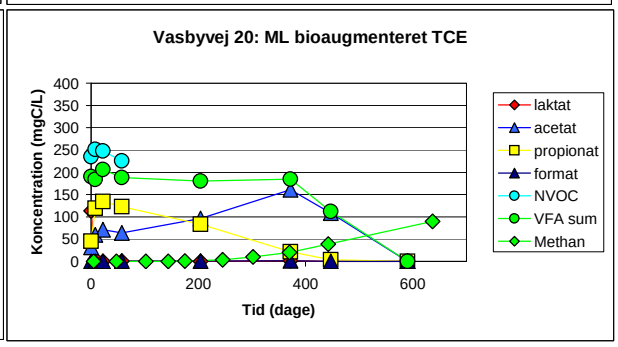




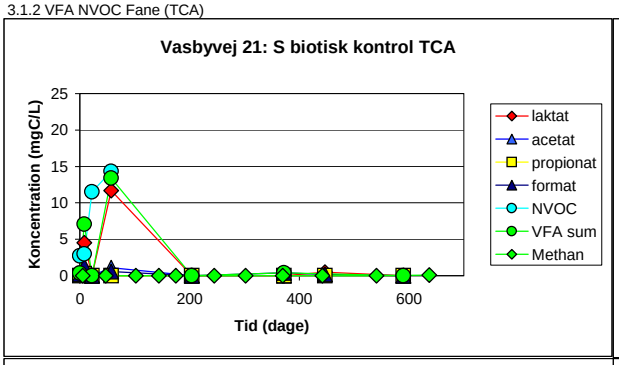


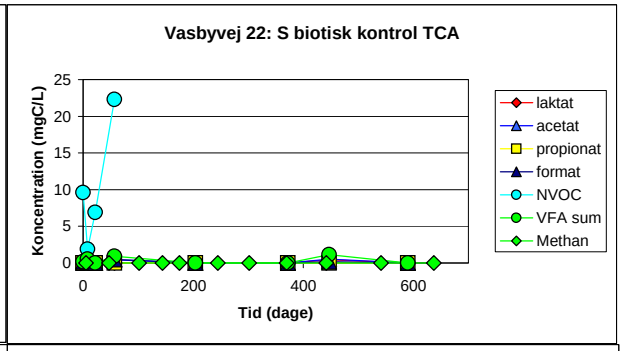


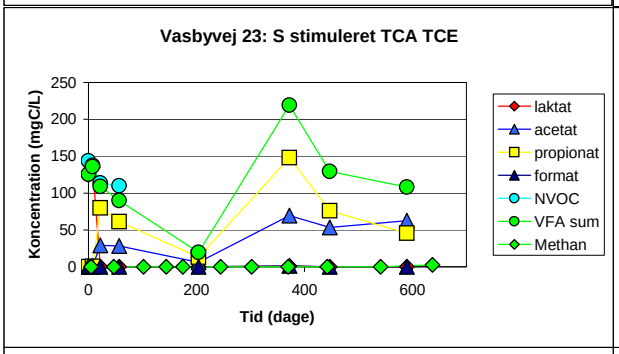


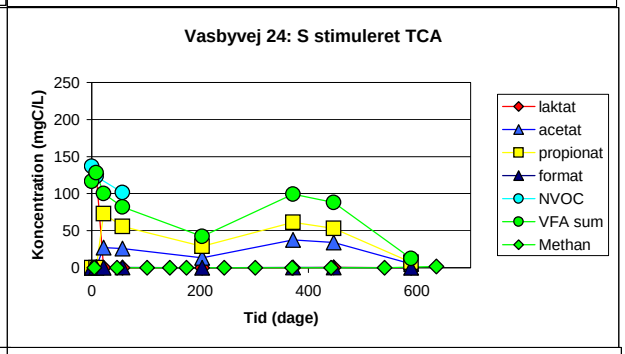


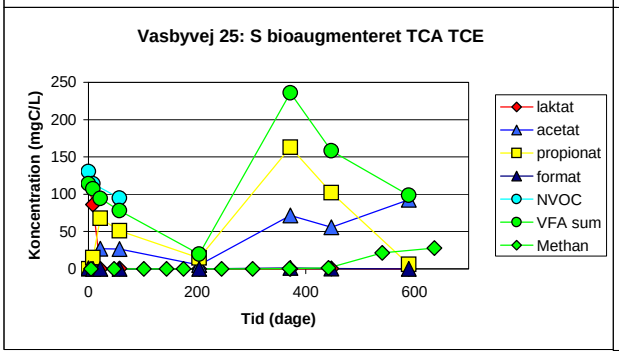
3.1 Vasbyvej Donor
3.1.2 VFA NVOC Fane (TCA)

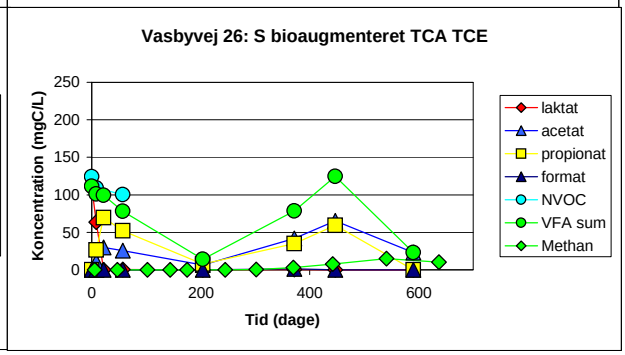




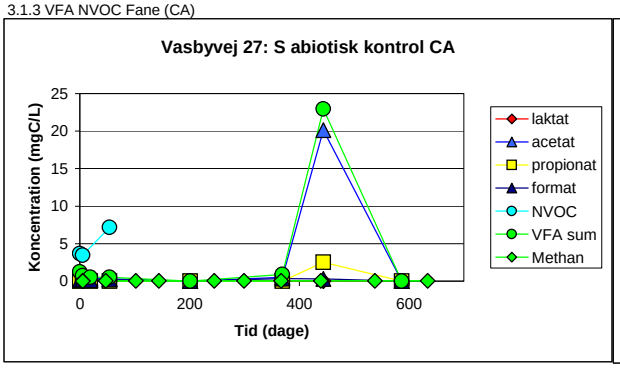


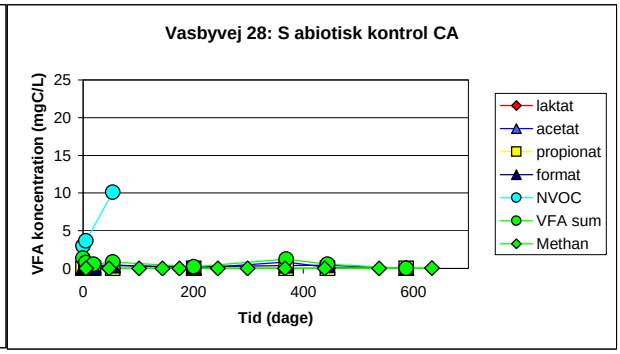


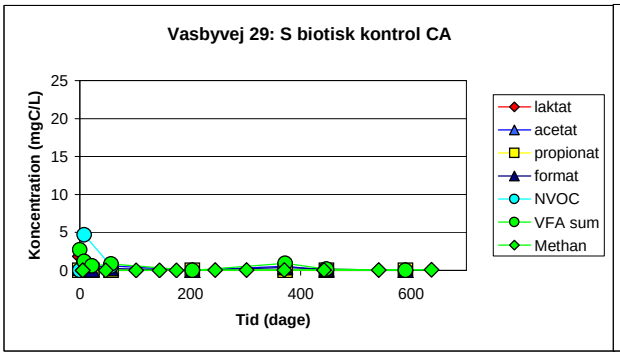


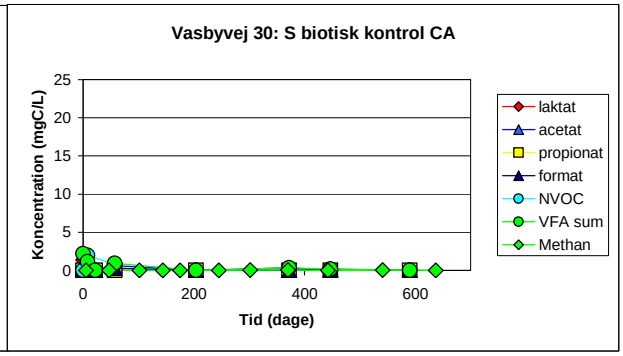


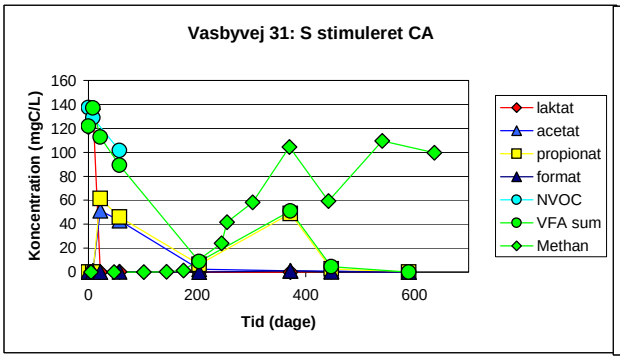
3.1 Vasbyvej Donor
3.1.3 VFA NVOC Fane (CA)

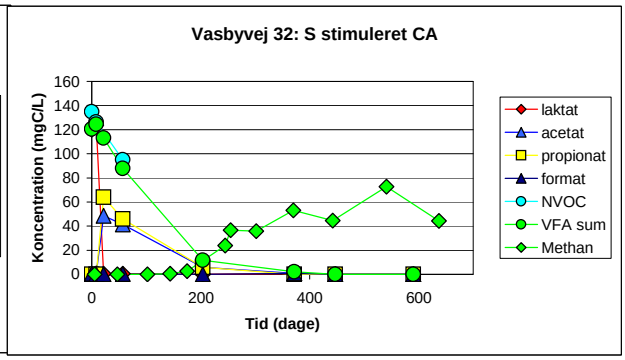


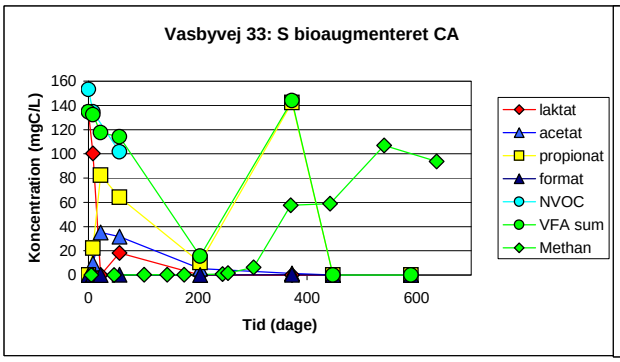


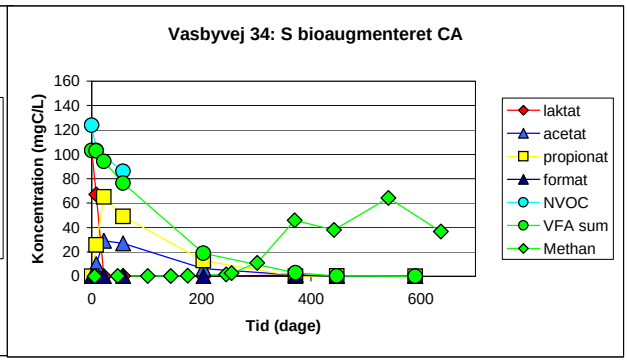






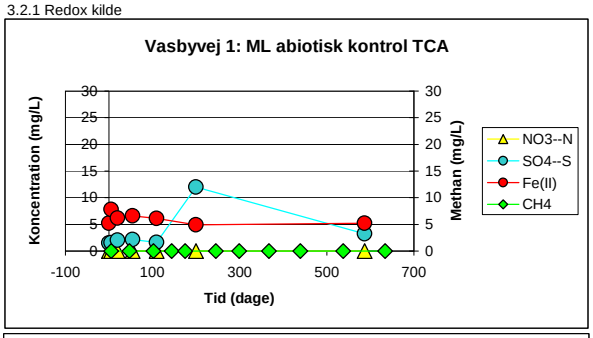


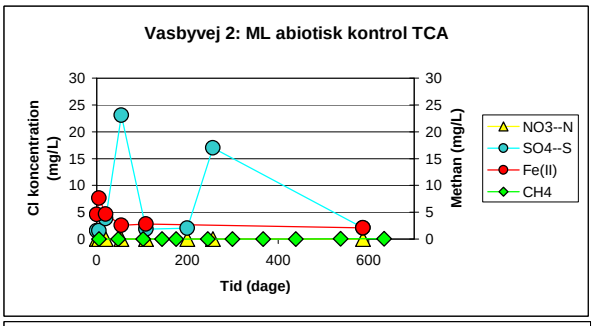


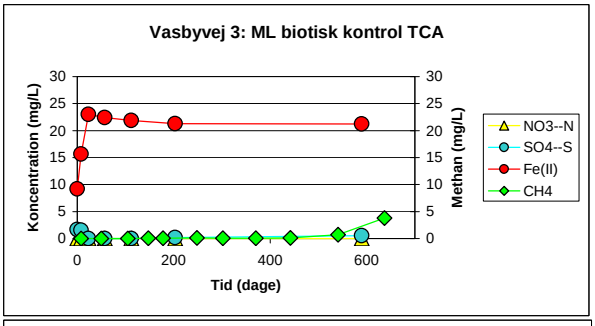


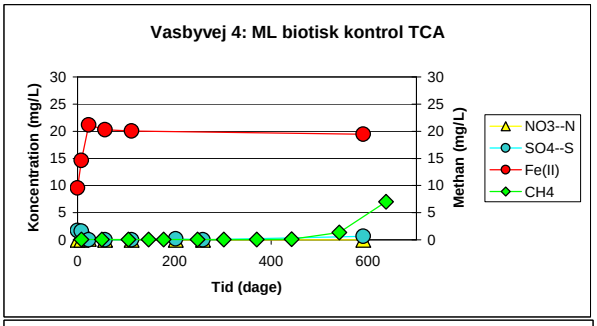
3.2 Vasbyvej Redox

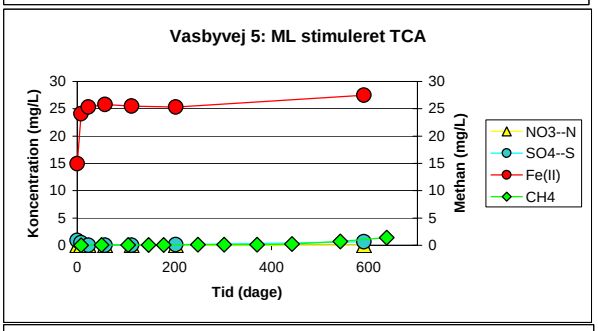
3.2.1 Redox kilde

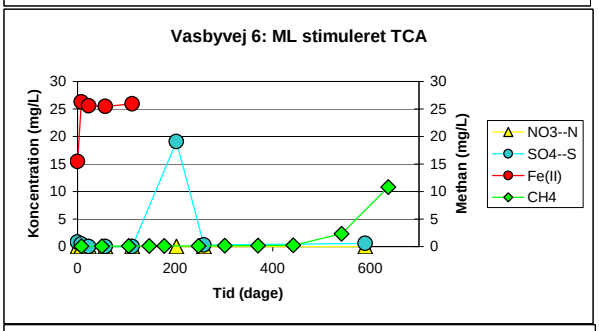


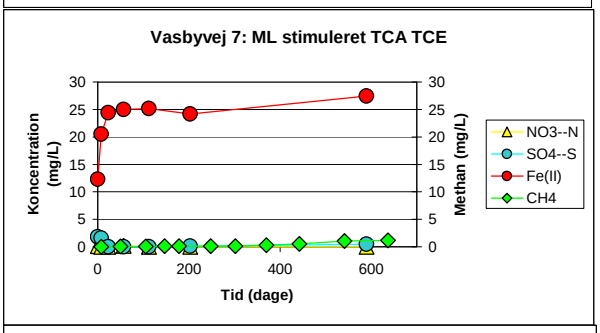


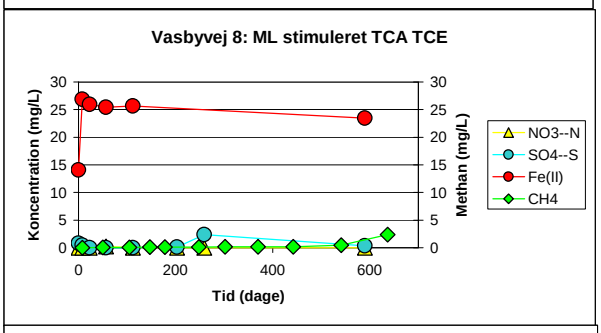


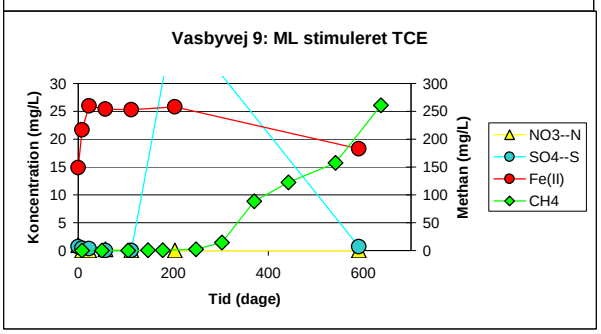


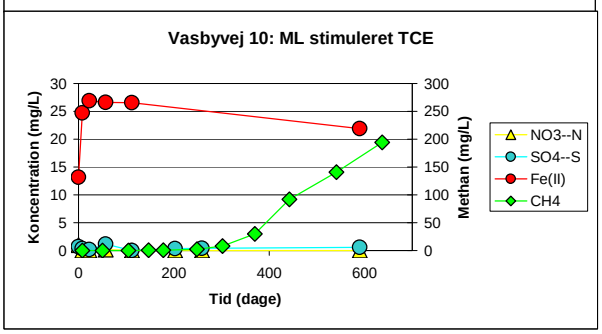




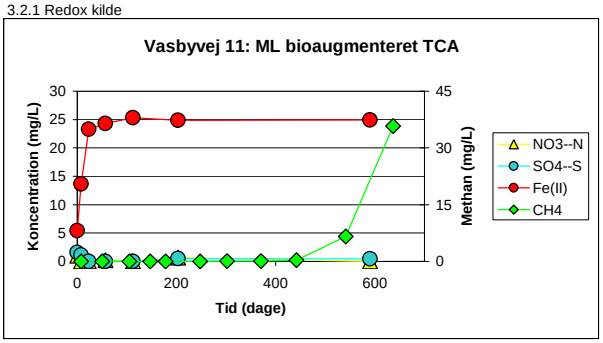


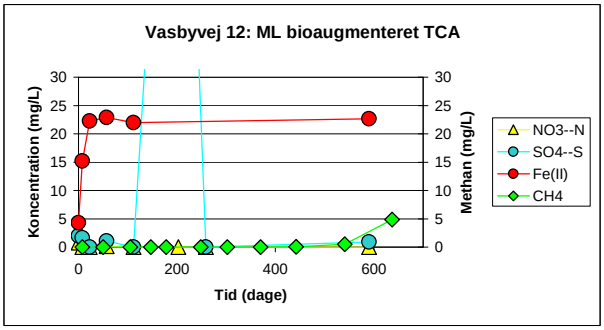


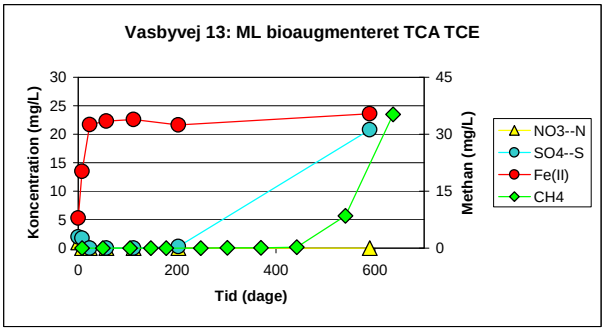


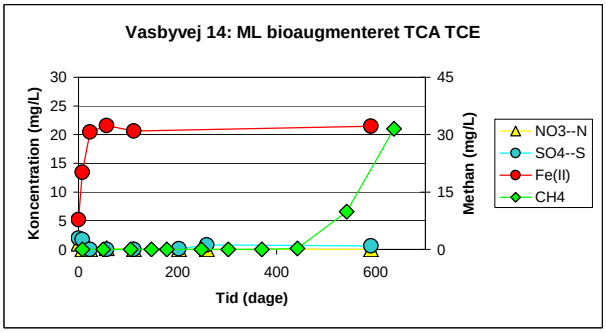


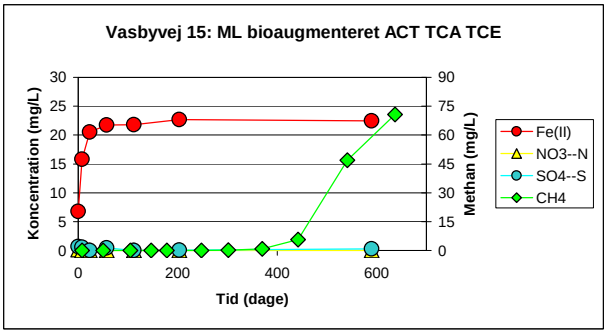
3.2.1 Redox kilde

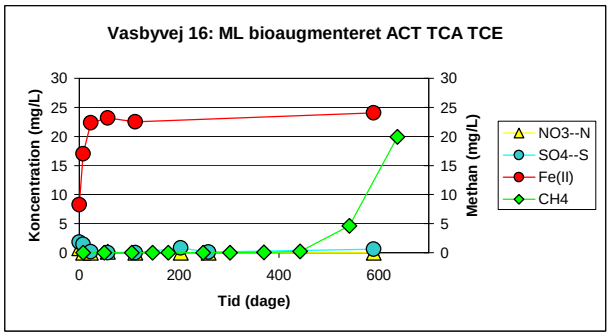


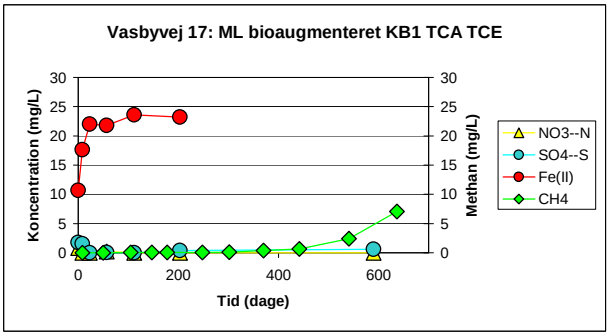


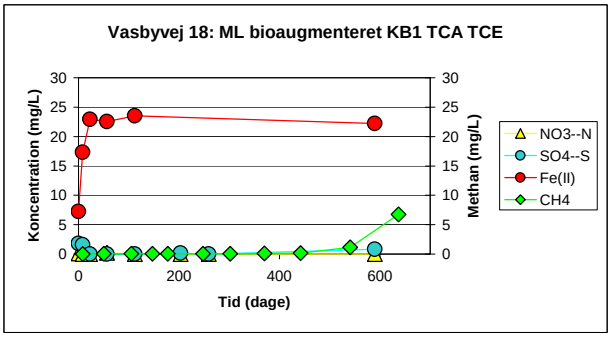


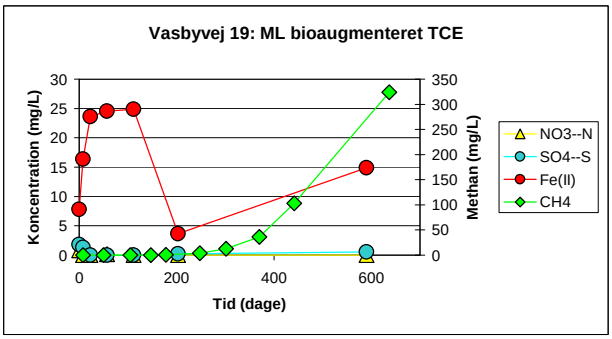


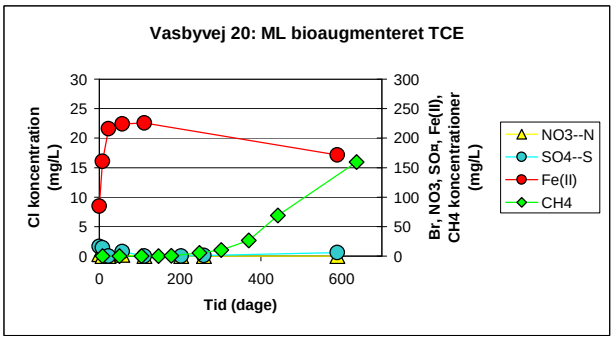




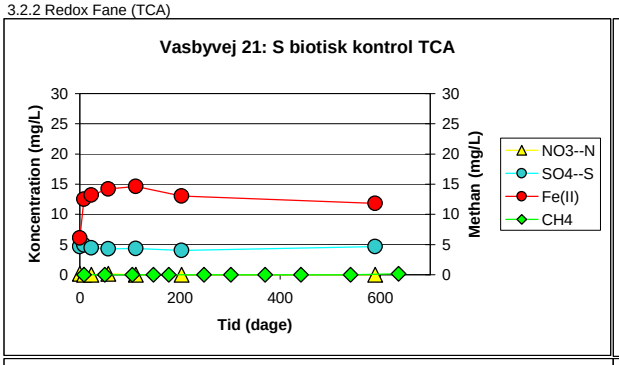


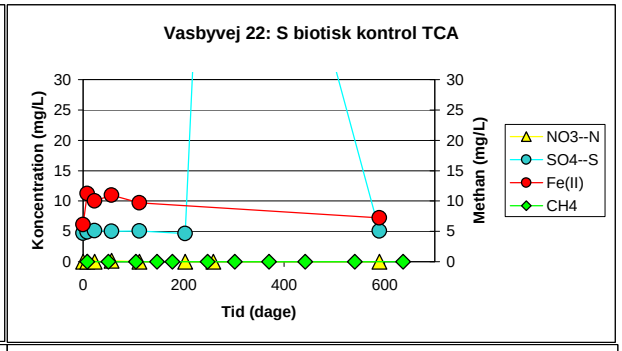


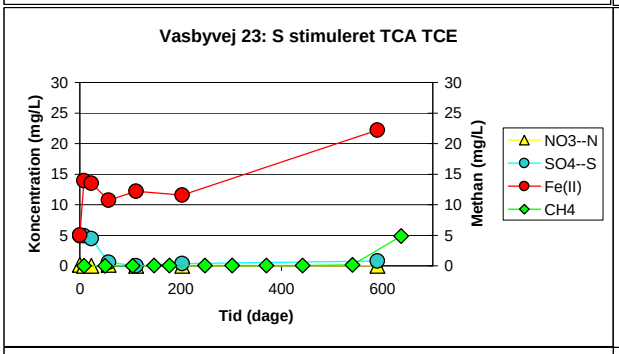


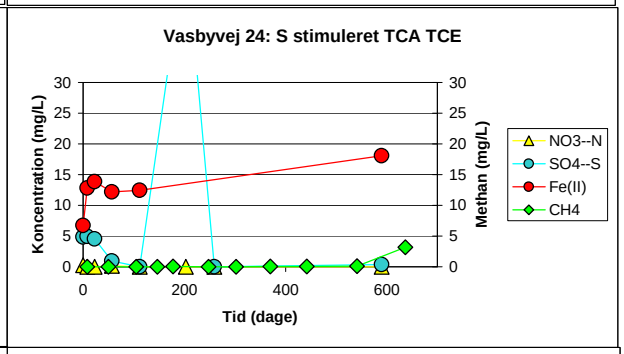


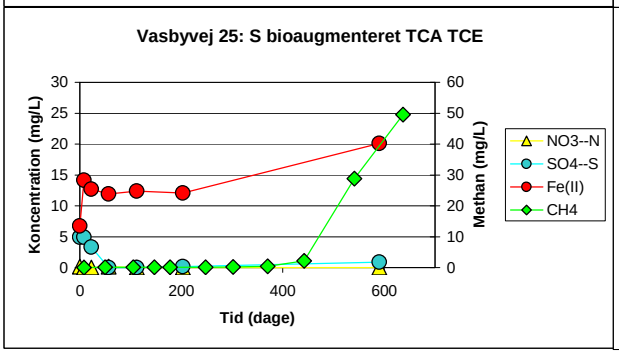
3.2 Vasbyvej Redox
3.2.2 Redox Fane (TCA)

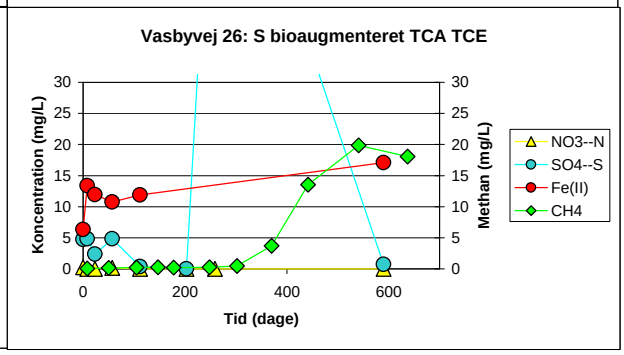






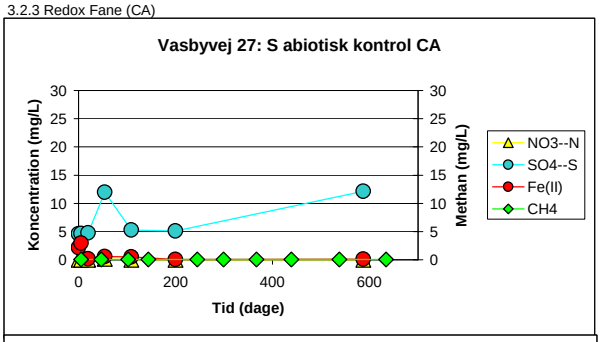


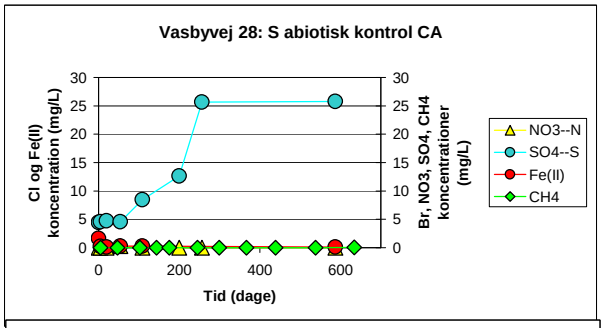


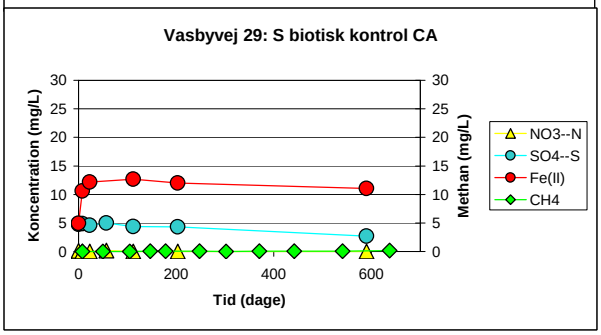


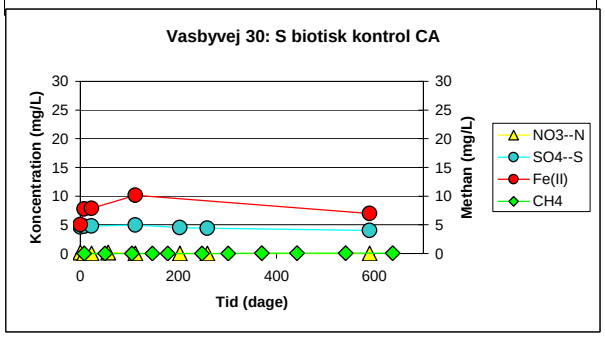
3.2 Vadsbyvej Redox

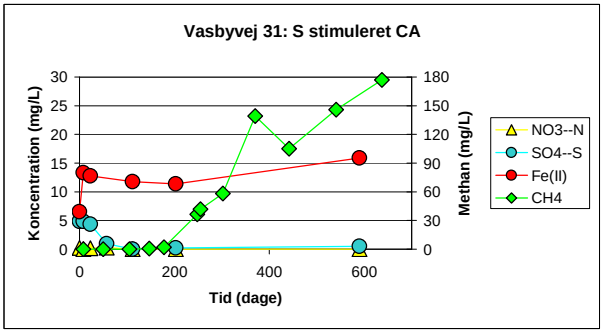
3.2.3 Redox Fane (CA)

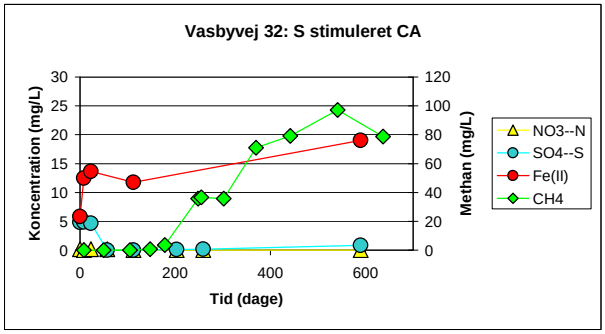


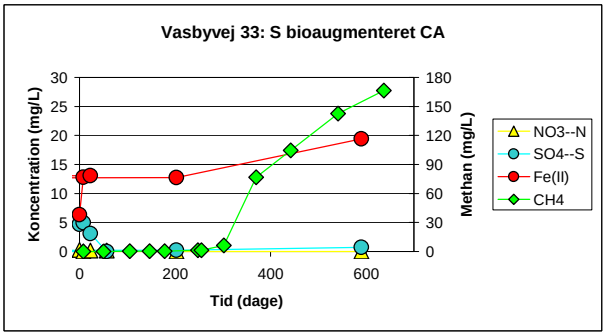


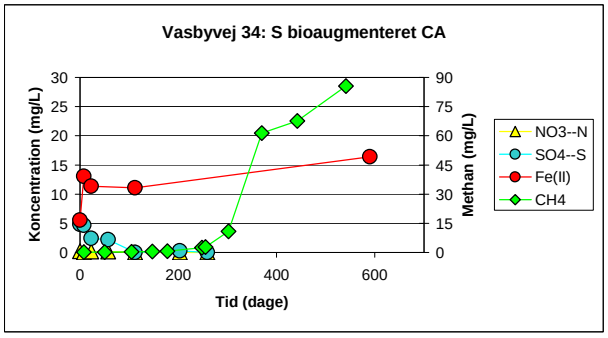






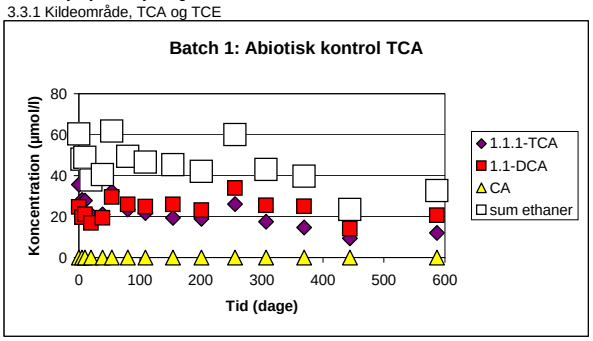


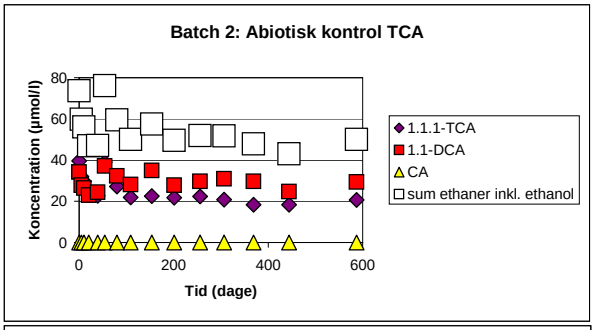


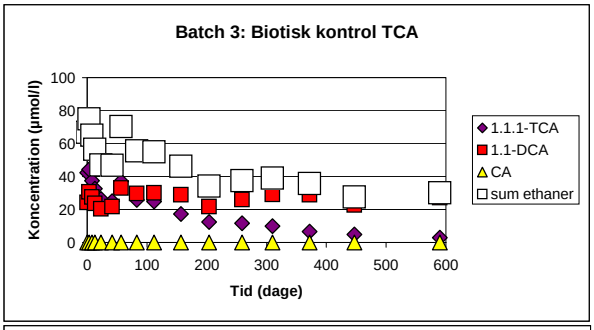


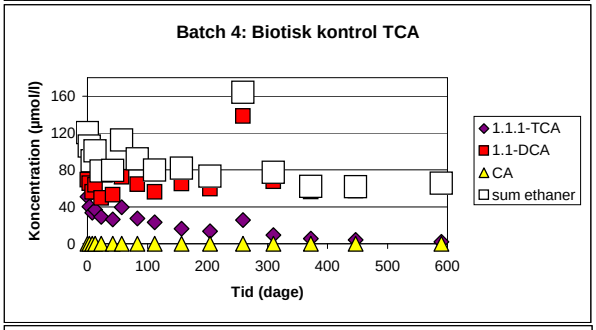
3.3 Vasbyvej. Nedbrydning af chlorerede ethaner

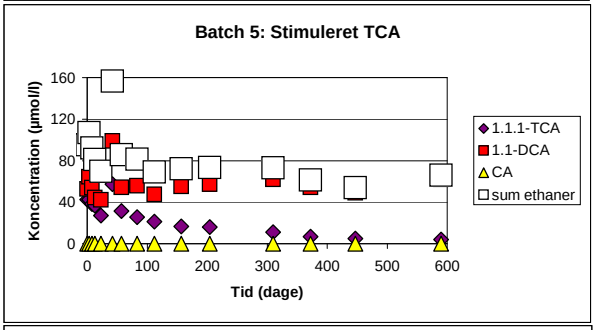
3.3.1 Kildeområde, TCA og TCE

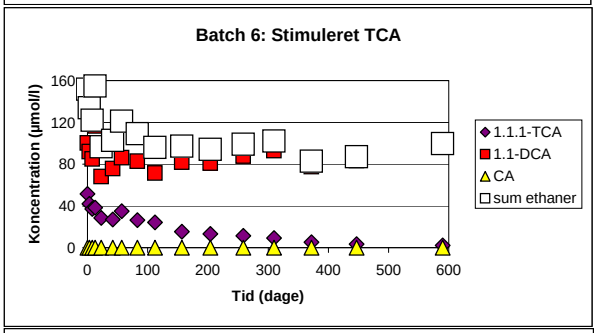


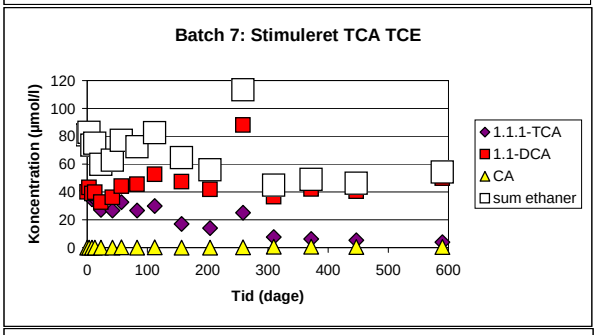


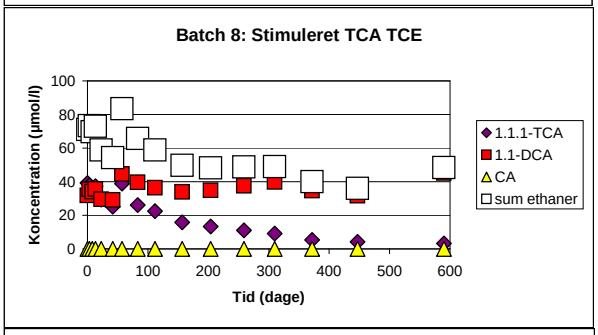


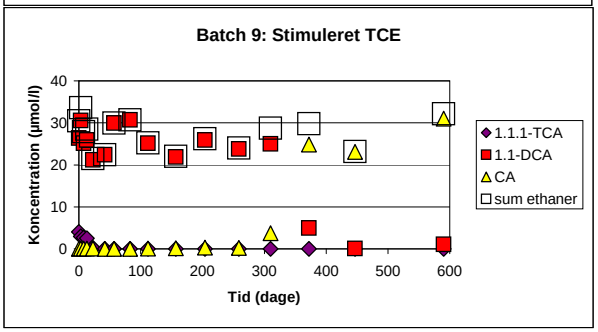


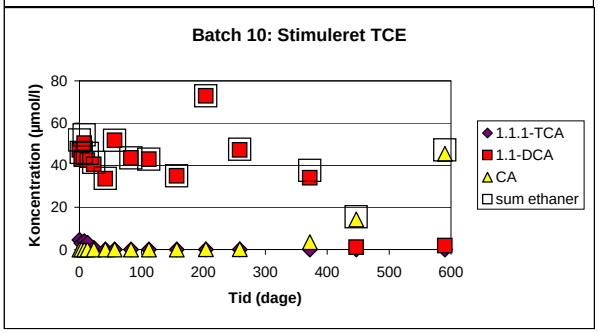




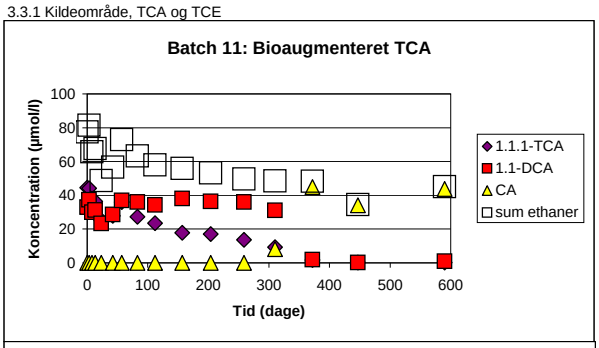


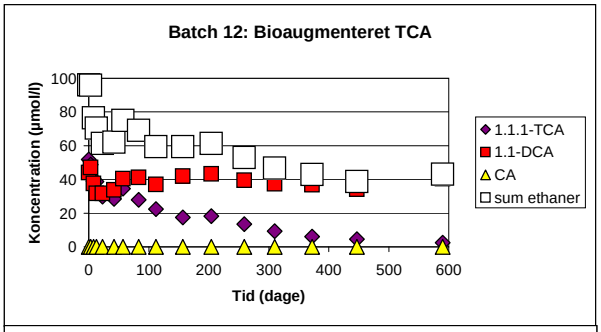


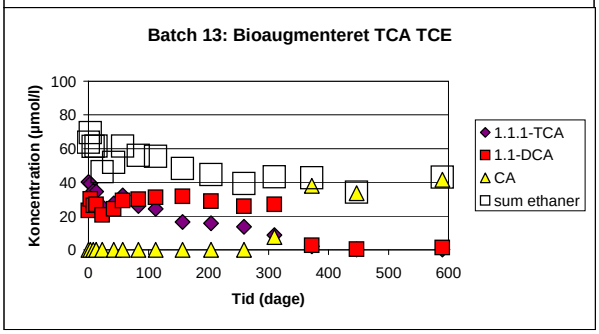


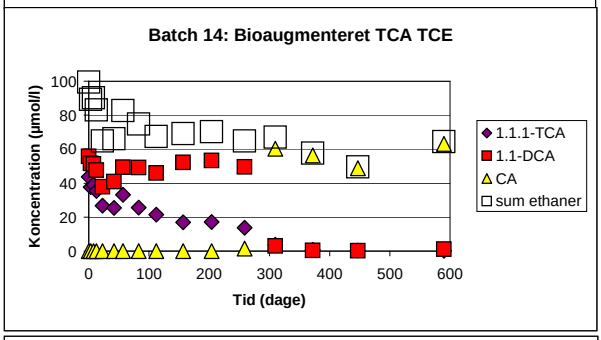


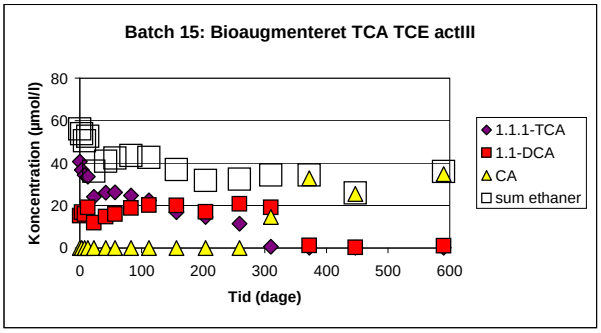
3.3.1 Kildeområde, TCA og TCE

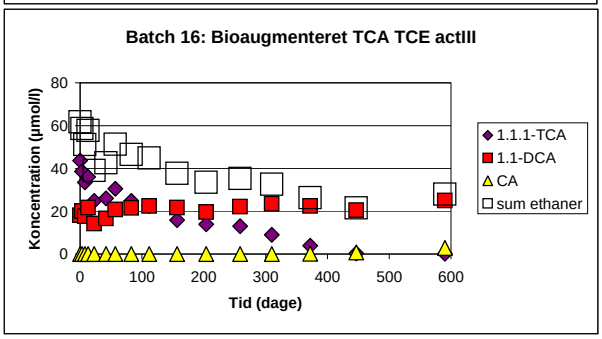


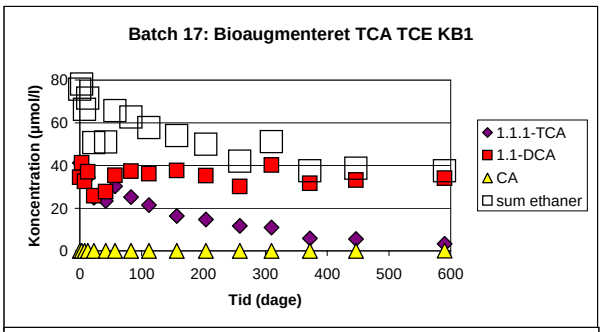


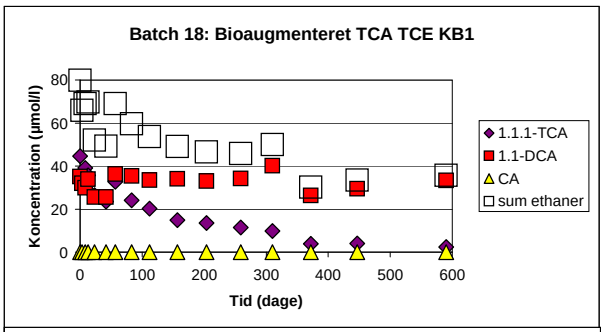


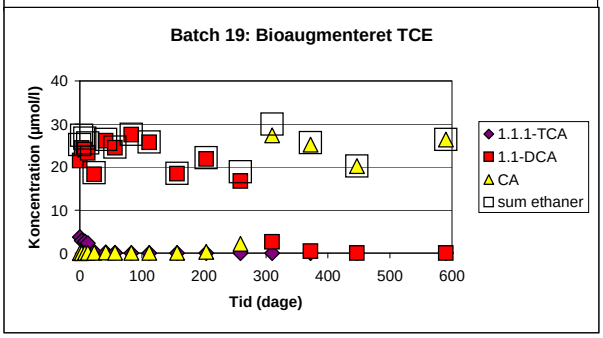


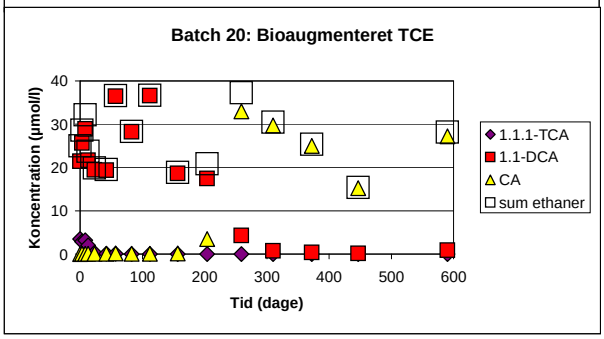




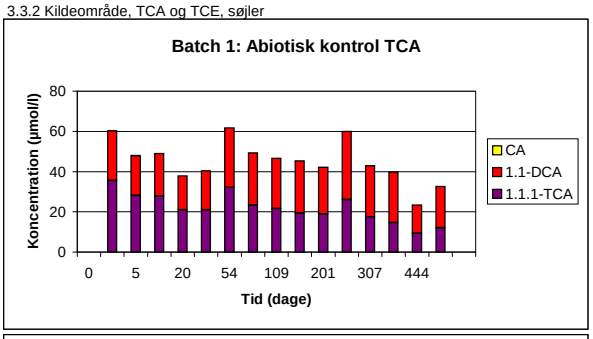


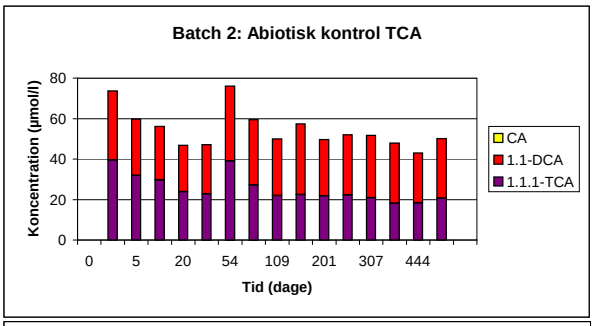


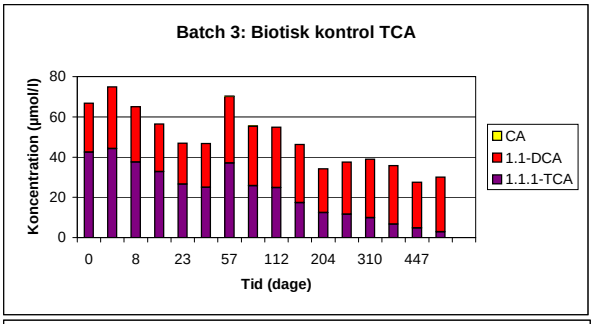


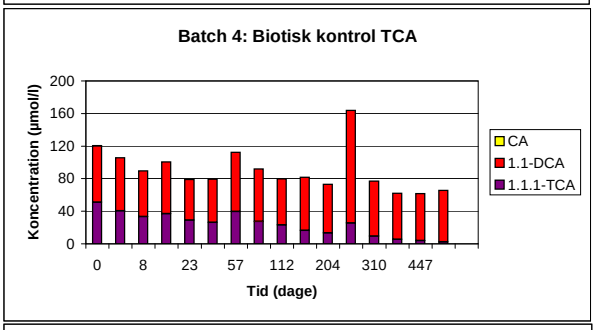


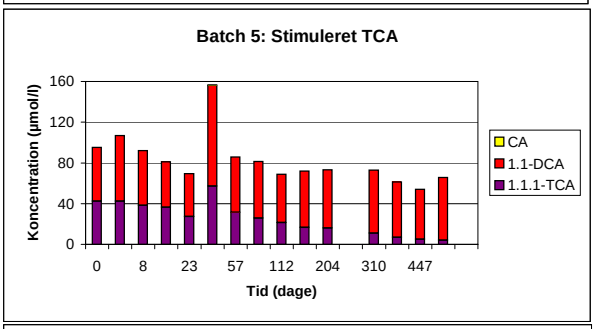
3.3 Vasbyvej, Nedbrydning af chlorerede ethaner
3.3.2 Kildeområde, TCA og TCE, søjler

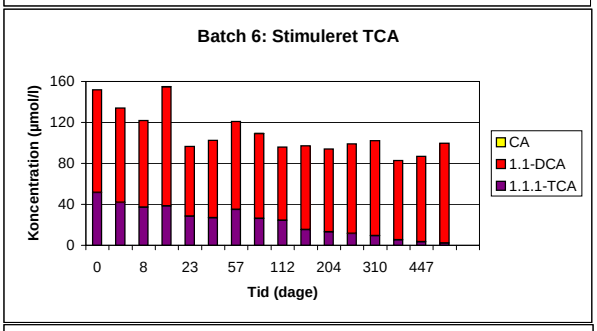


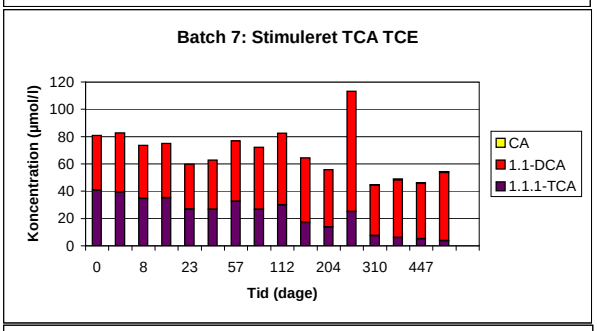


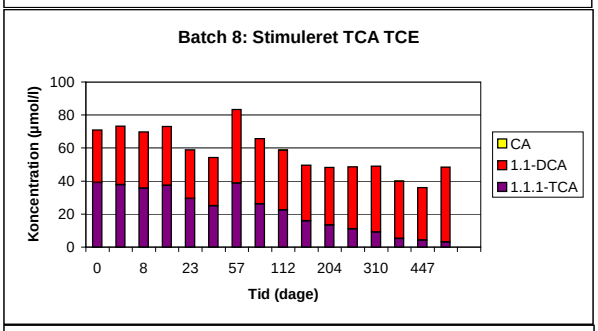


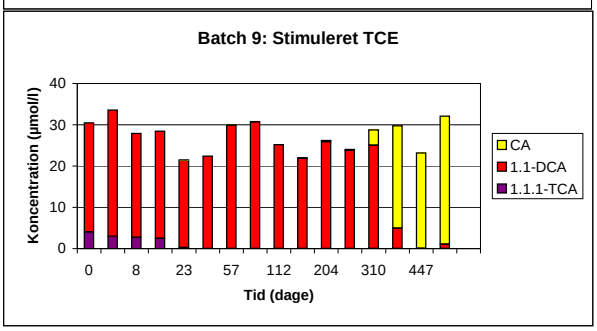


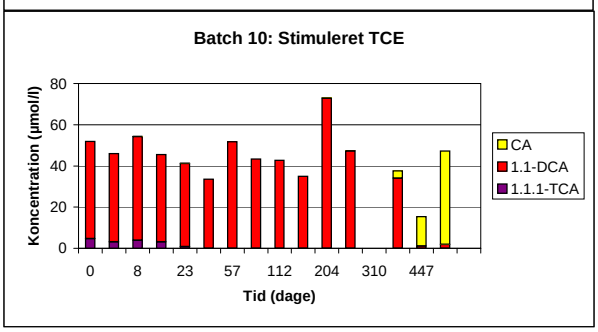




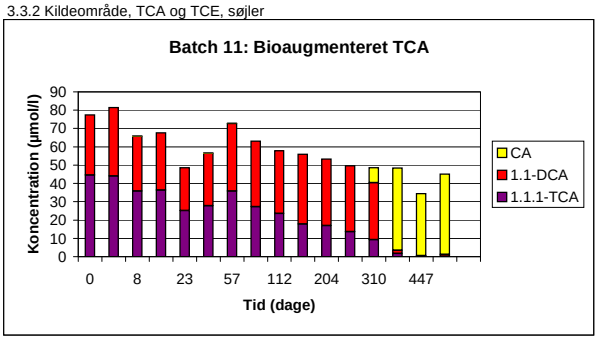


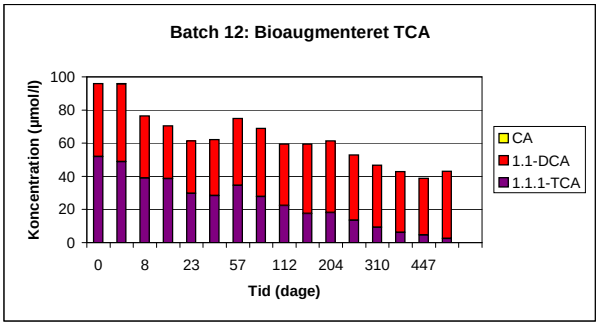


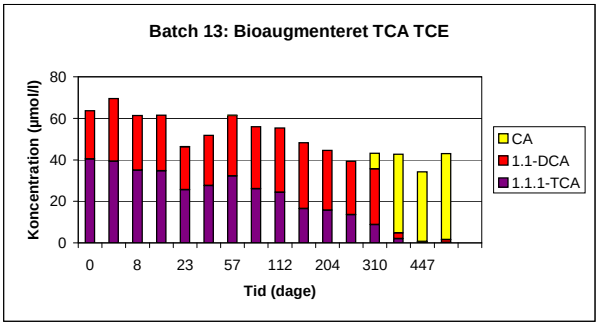


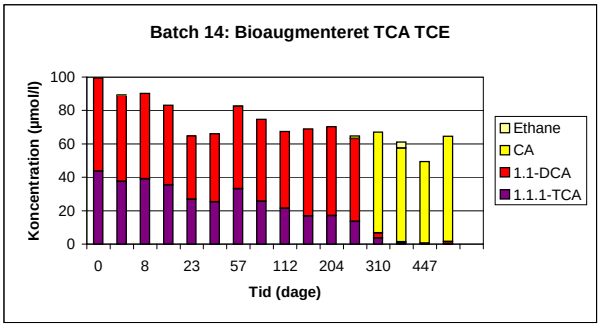


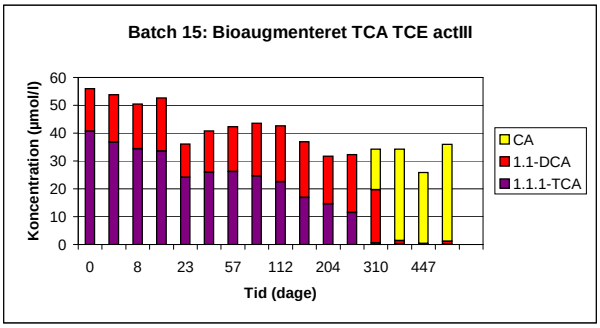
3.3.2 Kildeområde, TCA og TCE, søjler

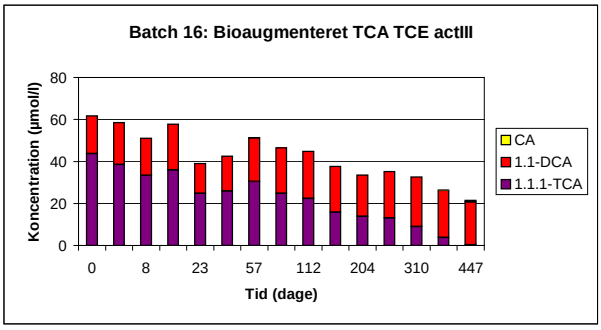


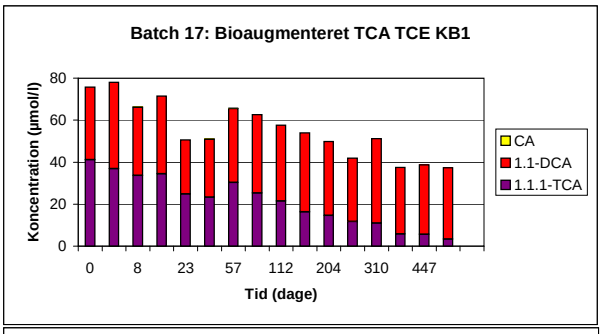


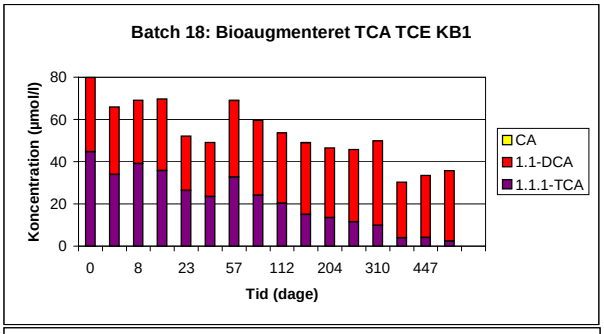


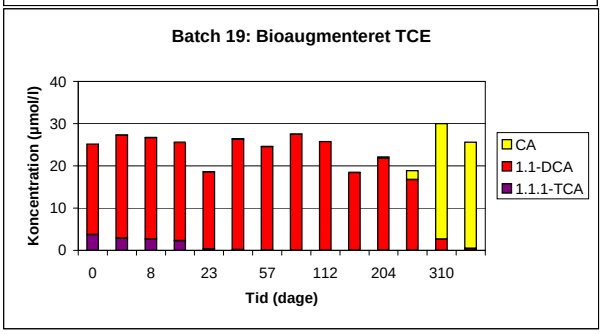


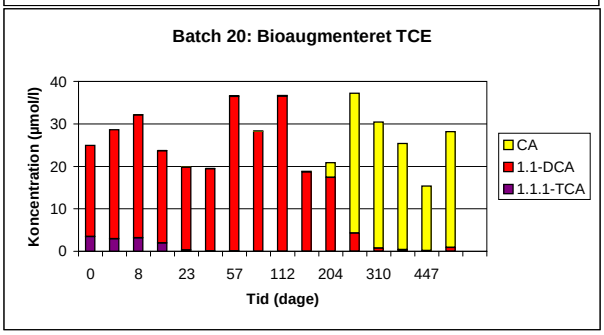




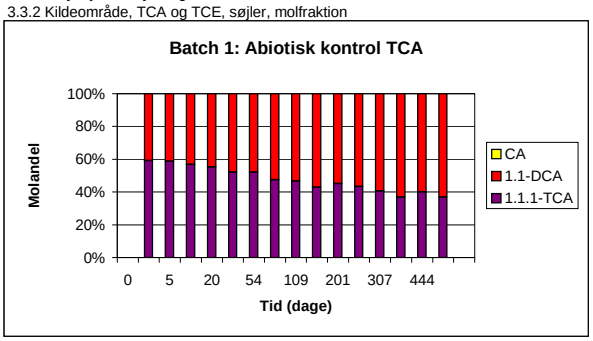


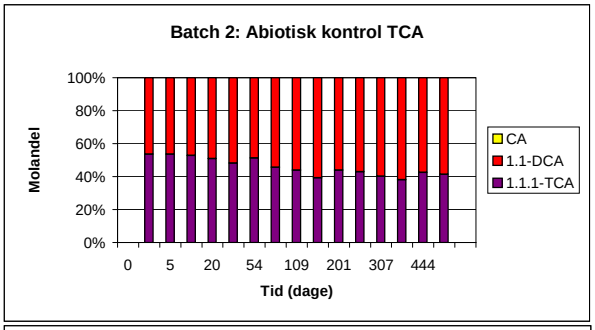


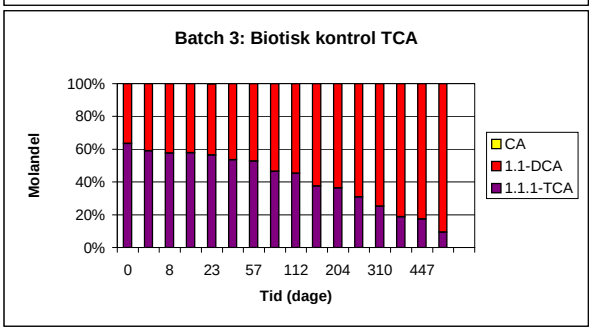


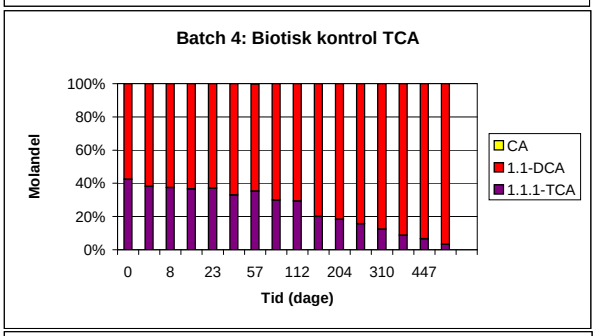


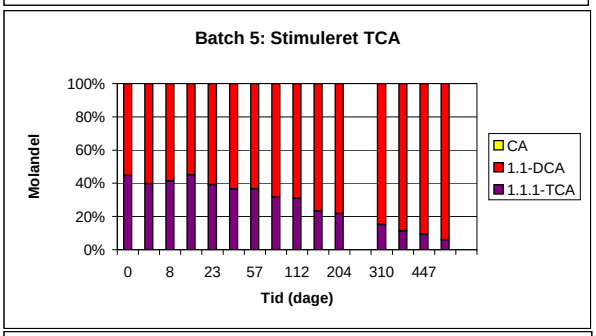
3.3 Vasbyvej, Nedbrydning af chlorerede ethaner
3.3.2 Kildeområde, TCA og TCE, søjler, molfraktion

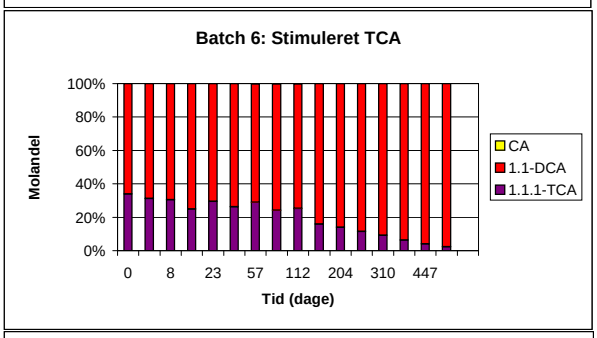


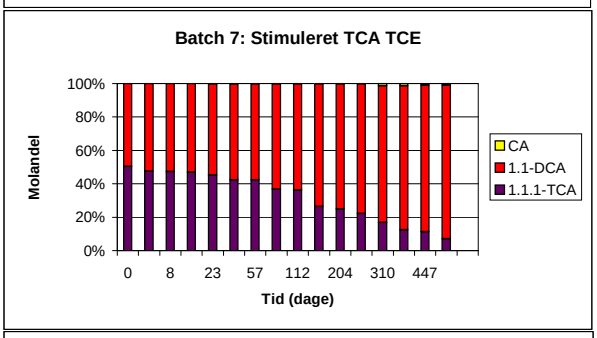


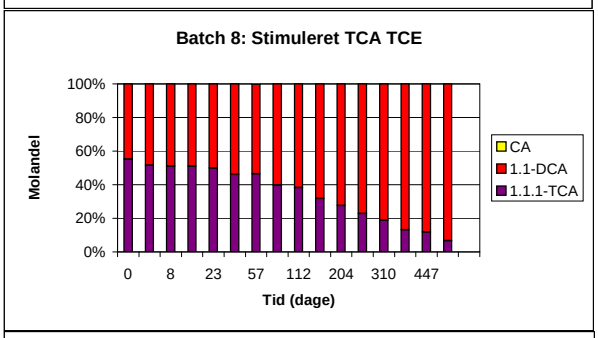


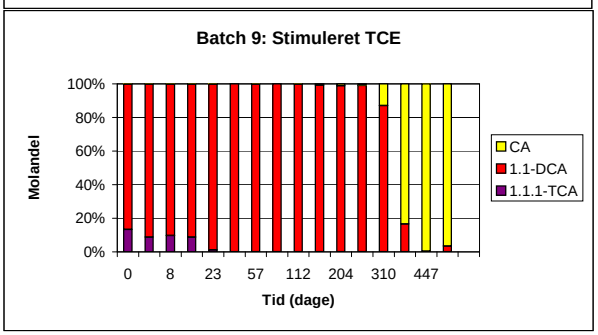


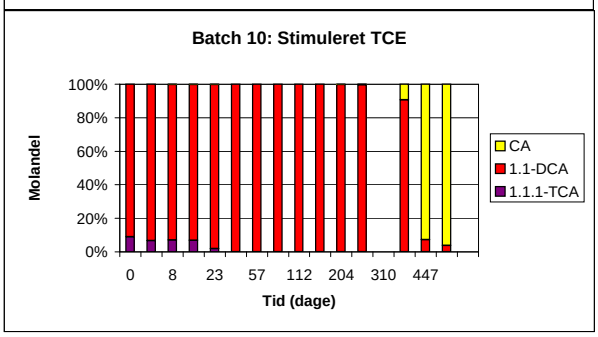




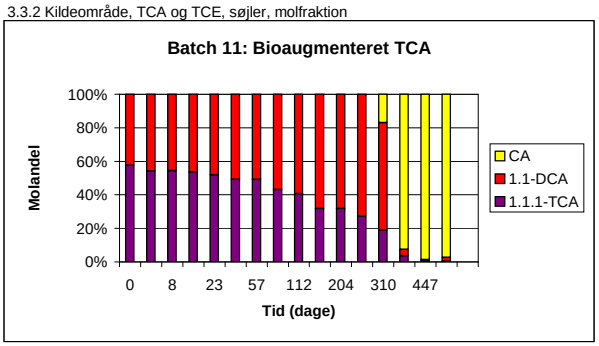


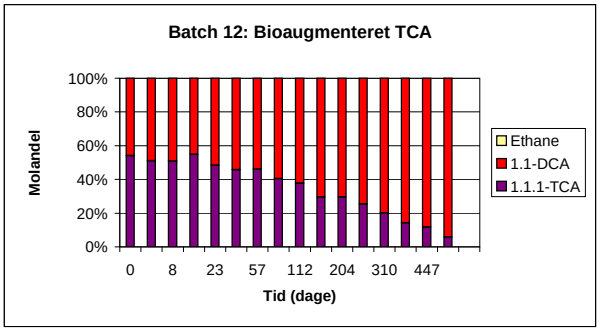


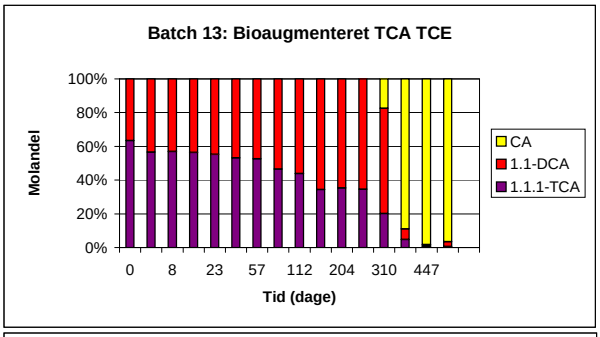


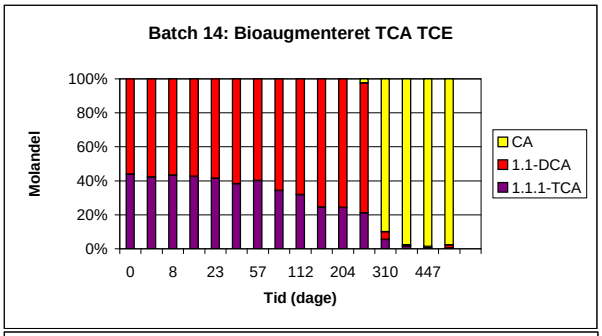


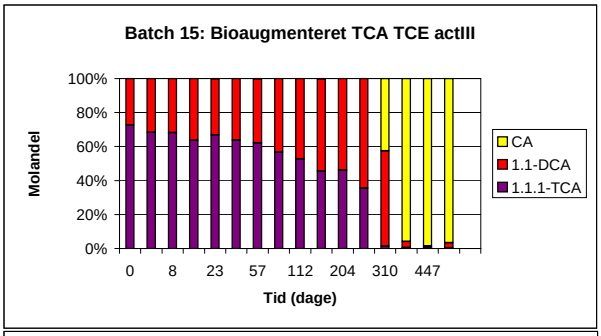
3.3.2 Kildeområde, TCA og TCE, søjler, molfraktion

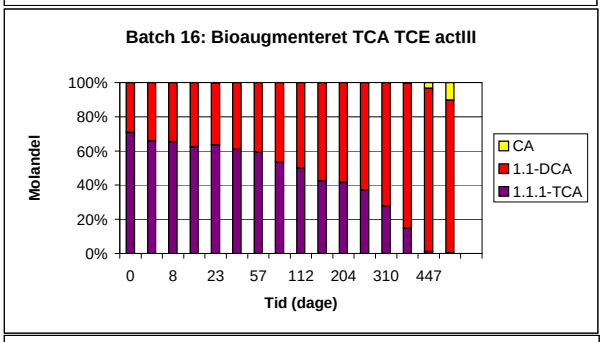


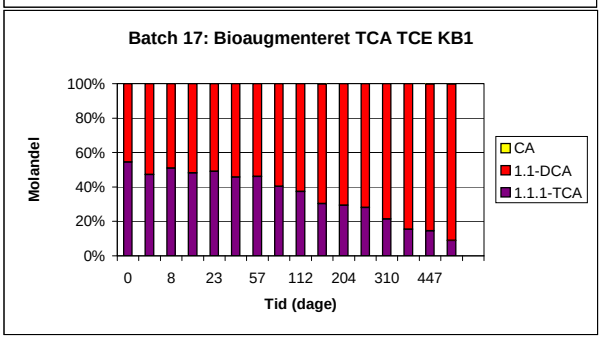


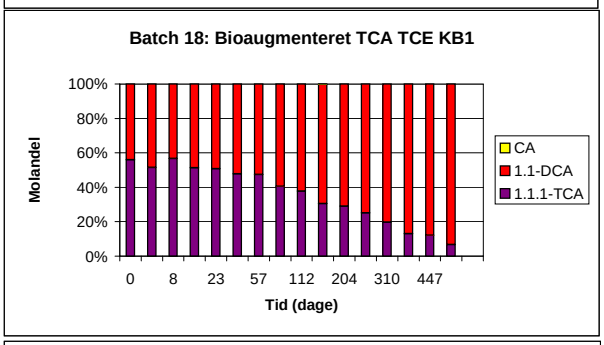


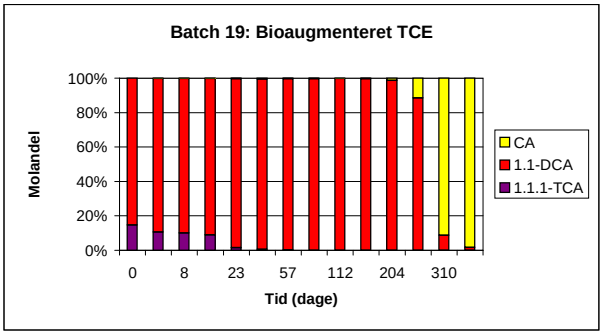


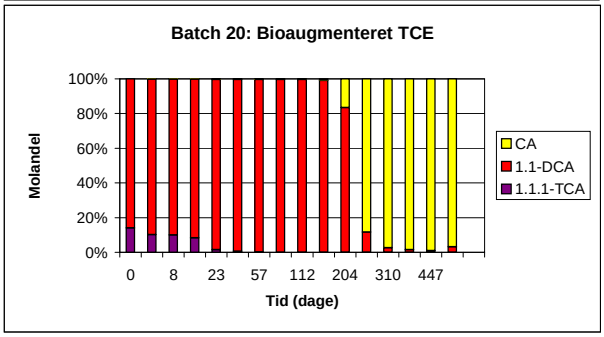






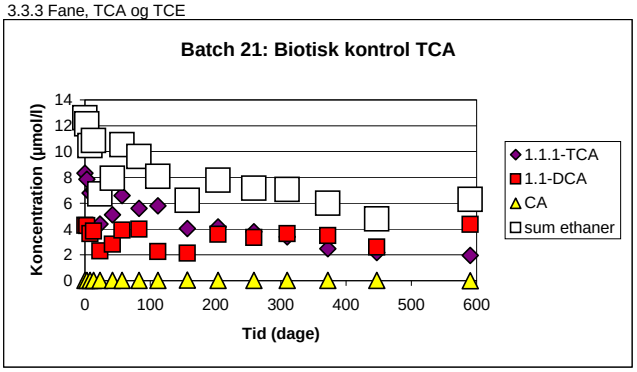


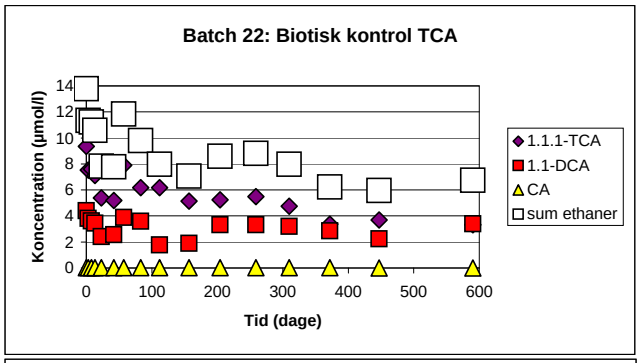


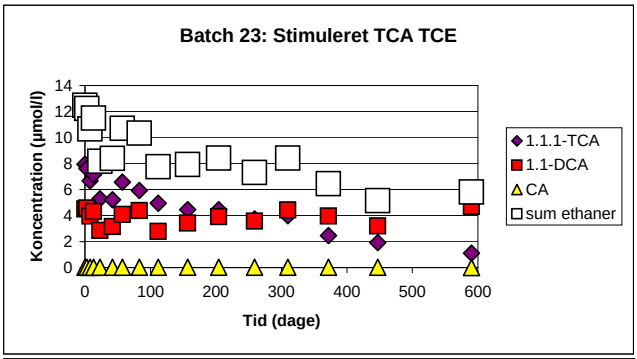


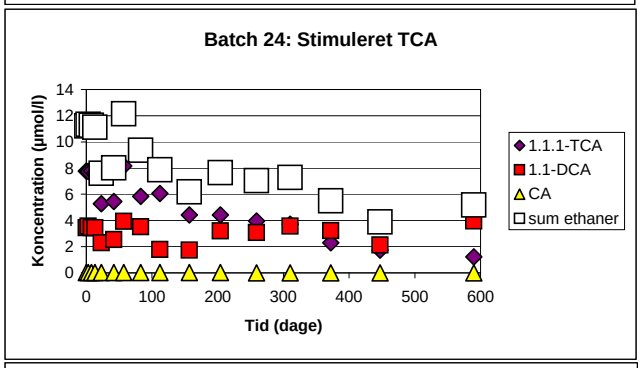
3.3 Vasbyvej, Nedbrydning af chlorerede ethaner

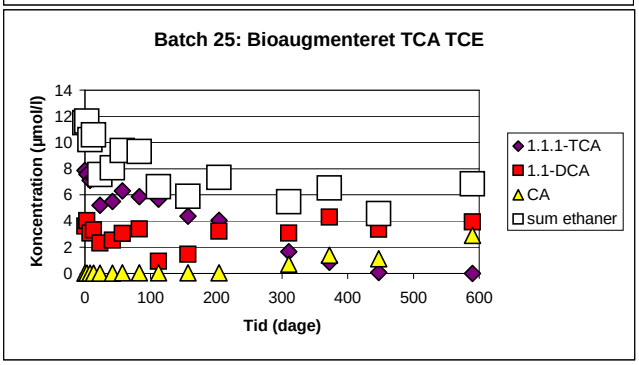
3.3.3 Fane, TCA og TCE

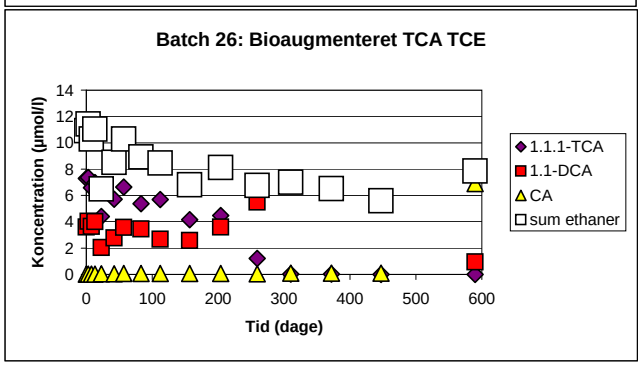




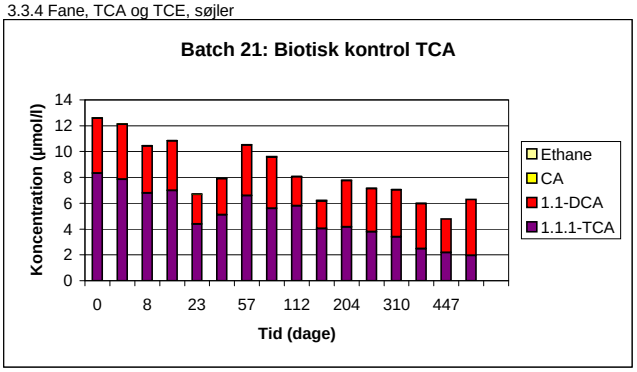


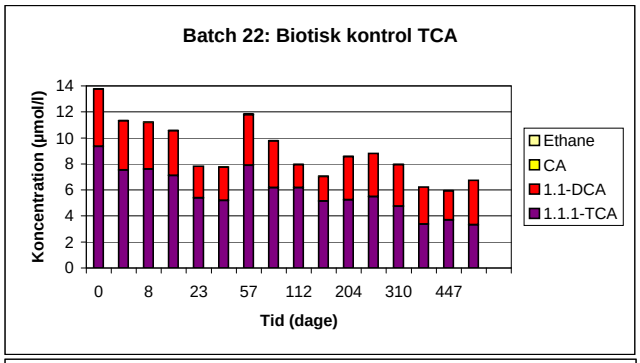


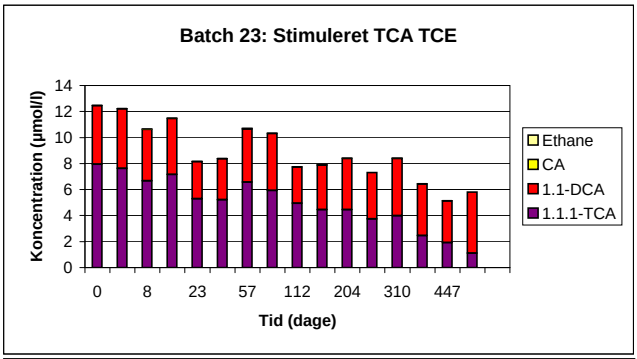


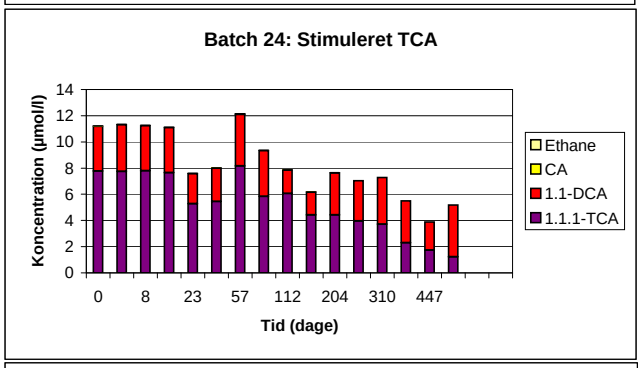


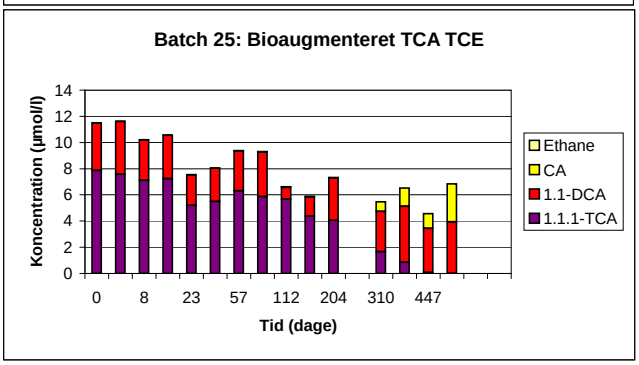
3.3 Vasbyvej, Nedbrydning af chlorerede ethaner
3.3.4 Fane, TCA og TCE, søjler

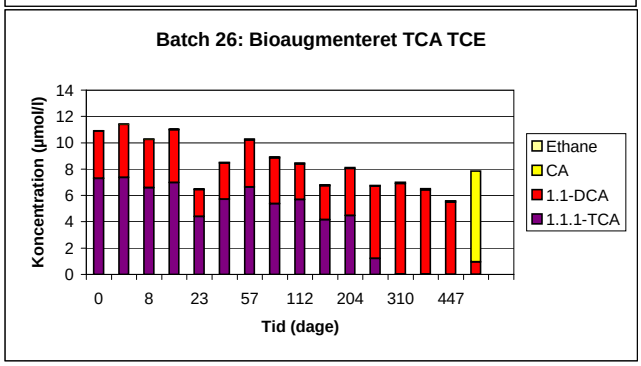






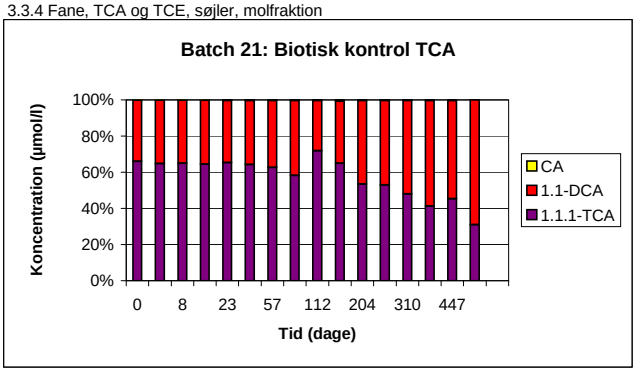


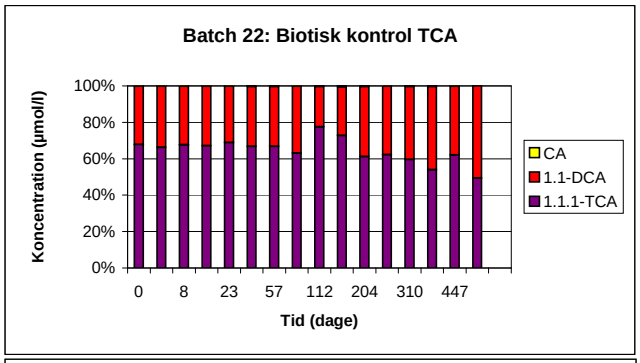


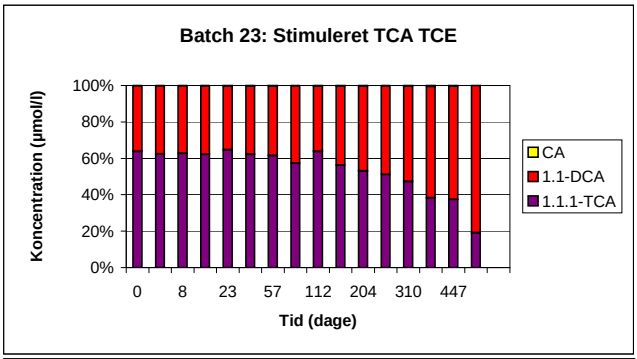


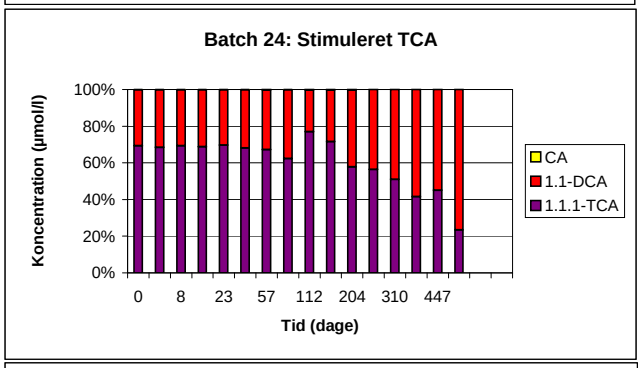
3.3 Vasbyvej, Nedbrydning af chlorerede ethaner

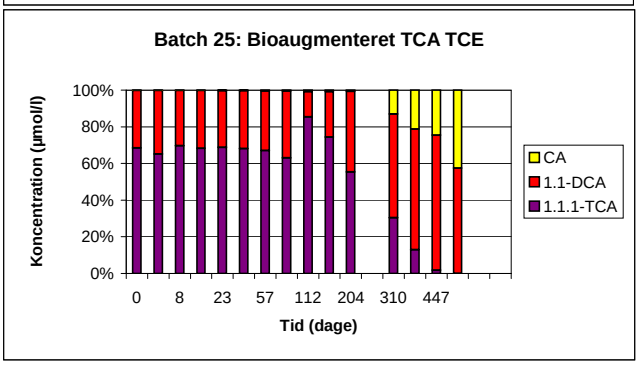
3.3.4 Fane, TCA og TCE, søjler, molfraktion

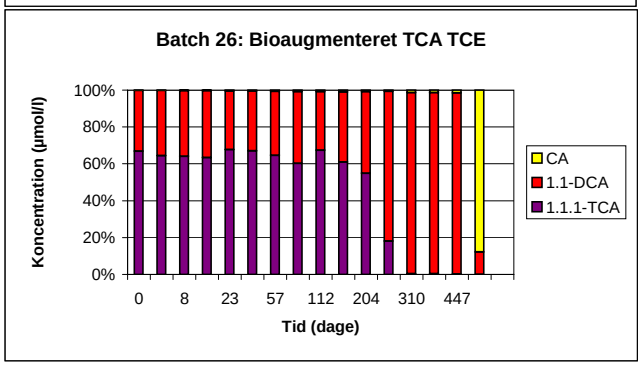


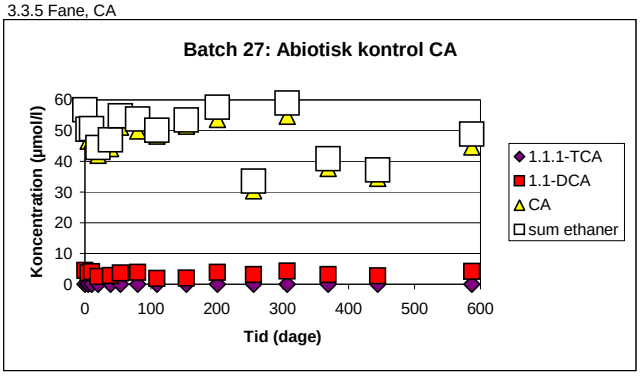








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Koncentration (µmol/l)
Tid (dage)
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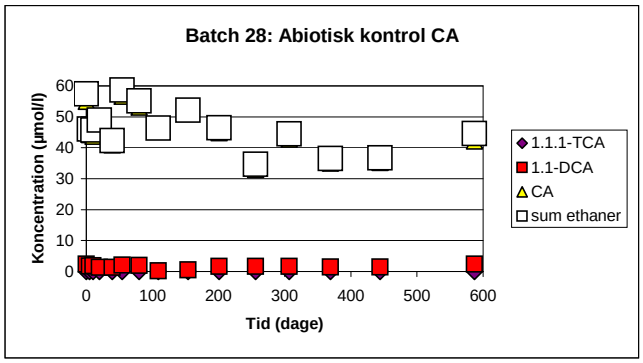
1.1-DCA
CA
sum ethaner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Koncentration (µmol/l)
Tid (dage)
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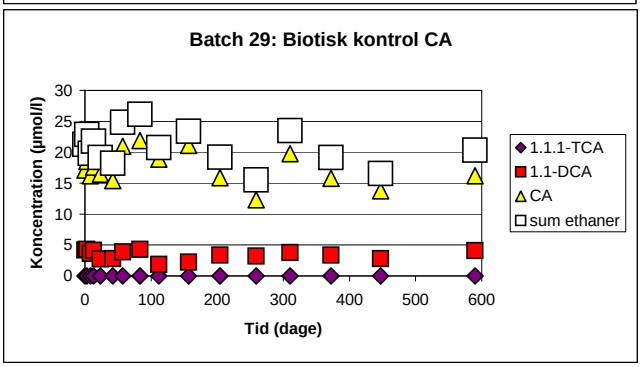
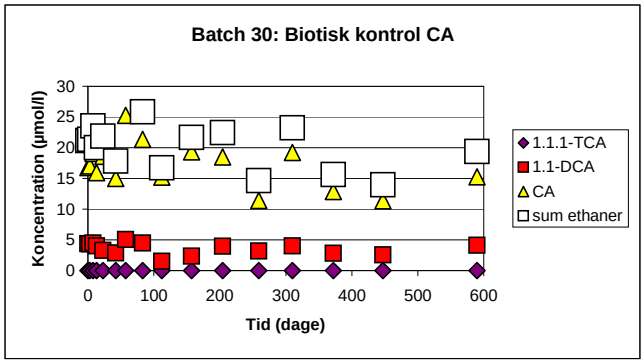
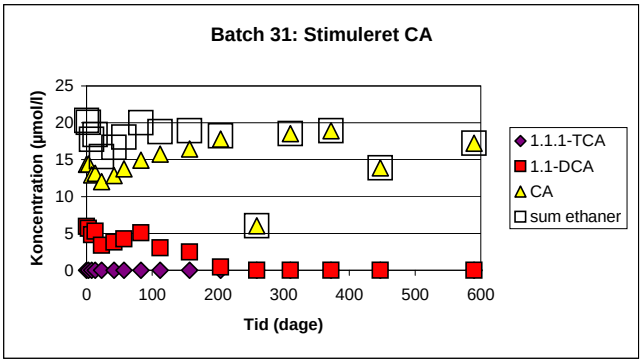
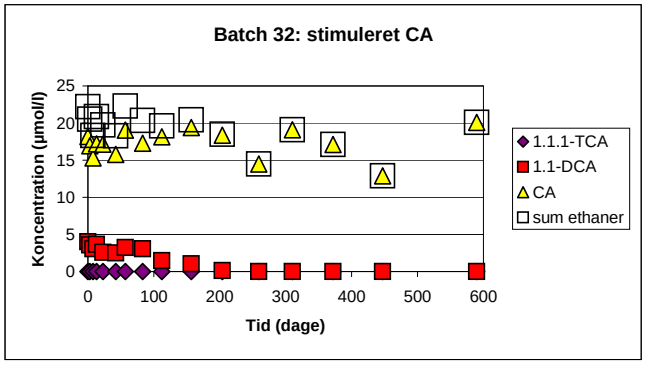
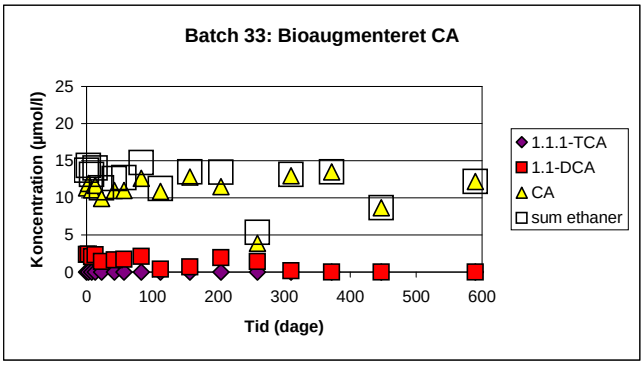
1.1-DCA
CA
sum ethaner

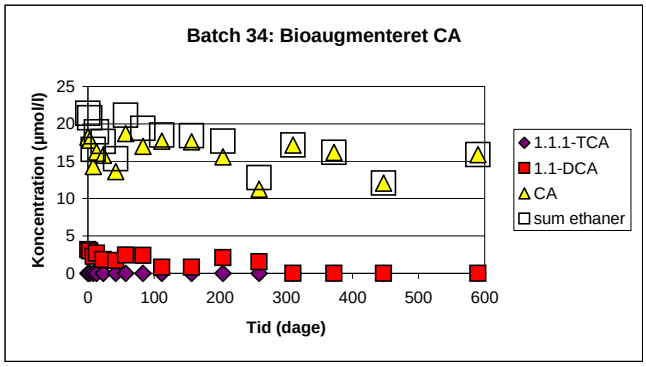

Batch 29: Biotisk kontrol CA
Koncentration (µmol/l)
Tid (dage)
1.1.1-TCA
1.1-DCA
CA
sum ethaner


Batch 30: Biotisk kontrol CA
Koncentration (µmol/l)
Tid (dage)
1.1.1-TCA
1.1-DCA
CA
sum ethaner

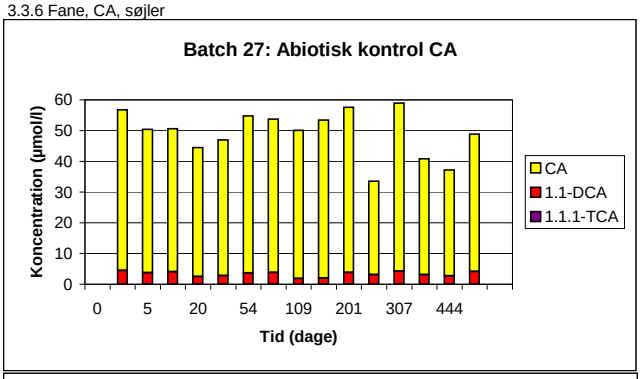

Batch 31: Stimuleret CA
Koncentration (µmol/l)
Tid (dage)
1.1.1-TCA
1.1-DCA
CA
sum ethaner

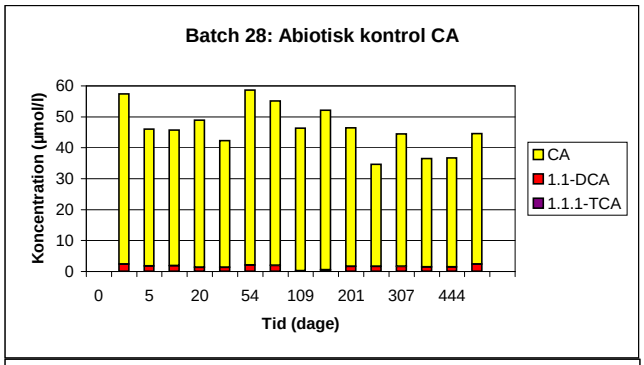

Batch 32: stimuleret CA
Koncentration (µmol/l)
Tid (dage)
1.1.1-TCA
1.1-DCA
CA
sum ethaner

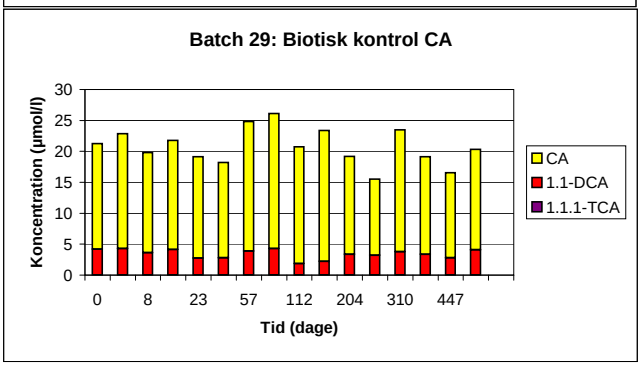

Batch 33: Bioaugmenteret CA
Koncentration (µmol/l)
Tid (dage)
1.1.1-TCA
1.1-DCA
CA
sum ethaner

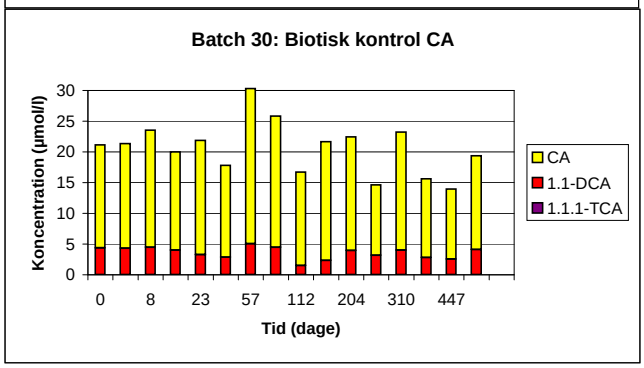

Batch 34: Bioaugmenteret CA
Koncentration (µmol/l)
Tid (dage)
1.1.1-TCA
1.1-DCA
CA
sum ethaner

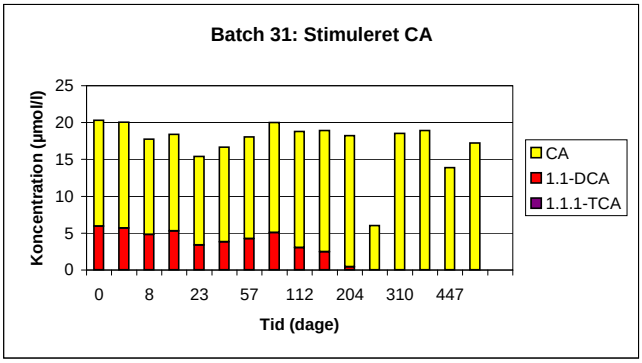
3.3 Vasbyvej, Nedbrydning af chlorerede ethaner
3.3.6 Fane, CA, søjler

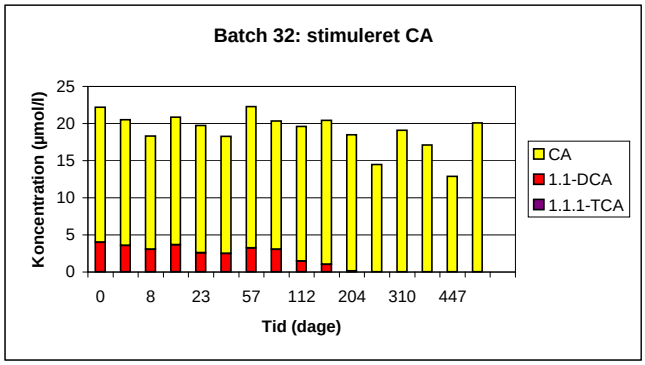


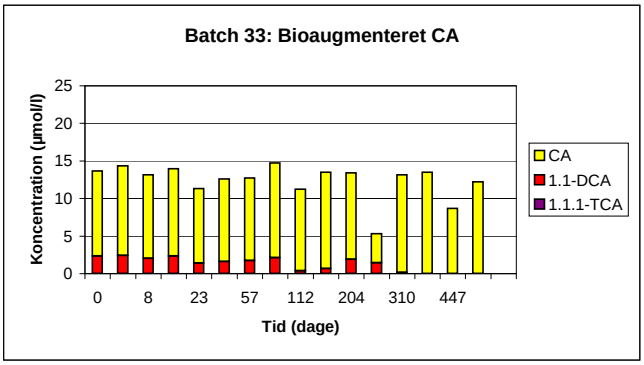


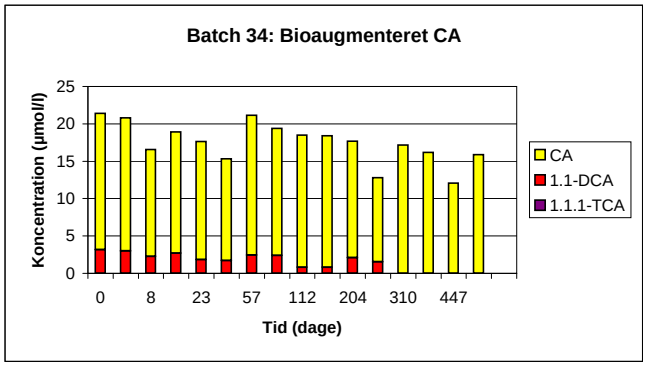




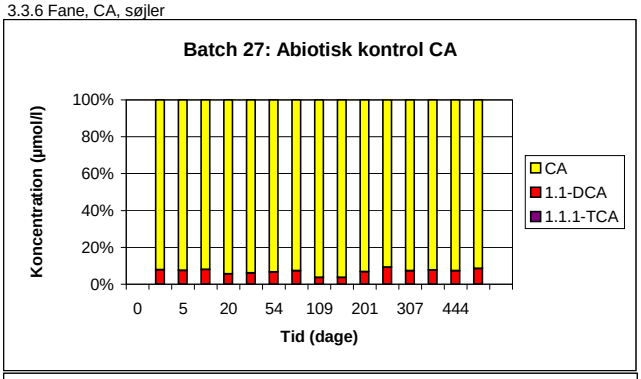


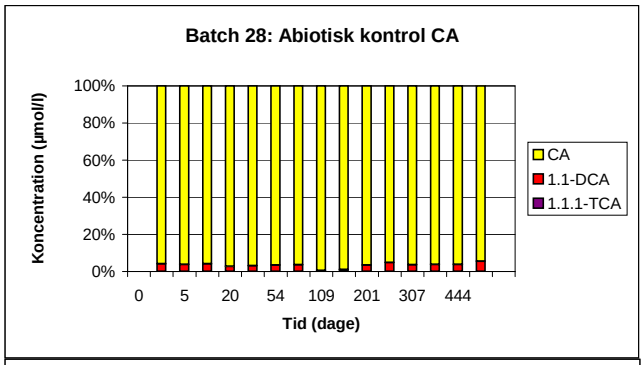


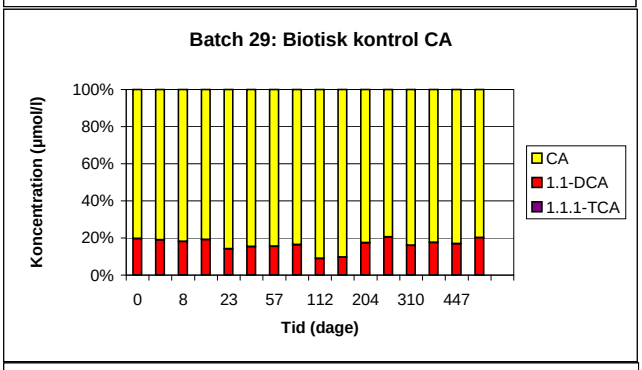


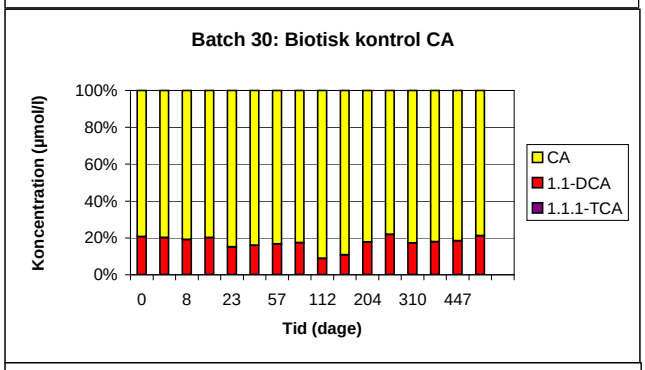


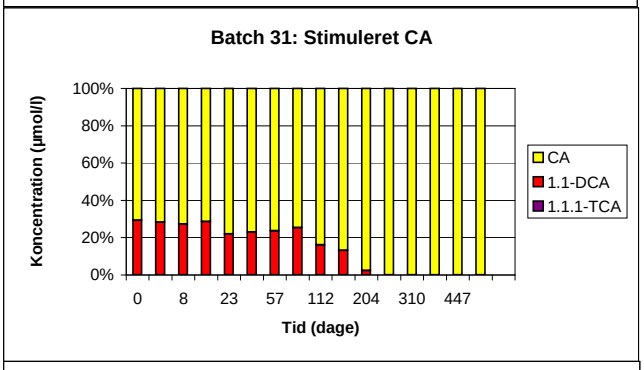
3.3 Vasbyvej, Nedbrydning af chlorerede ethaner
3.3.6 Fane, CA, søjler

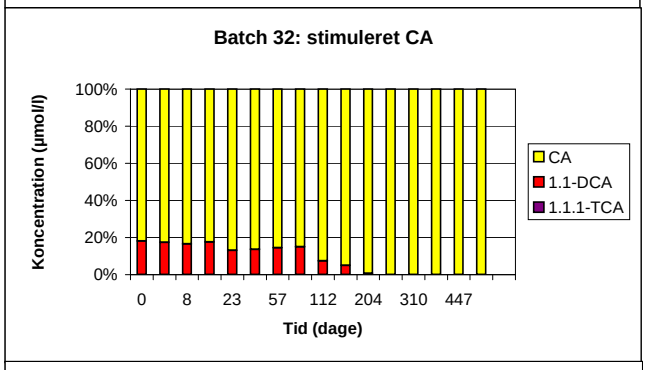


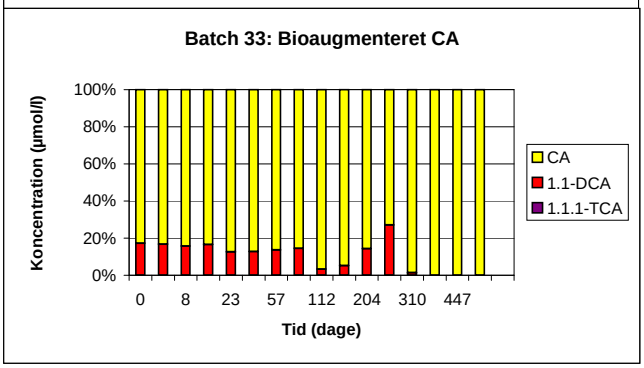


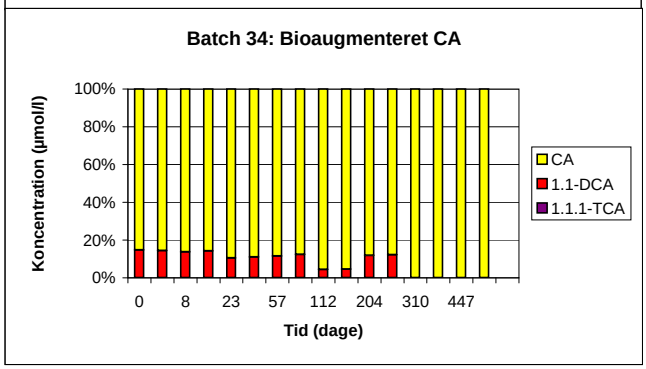




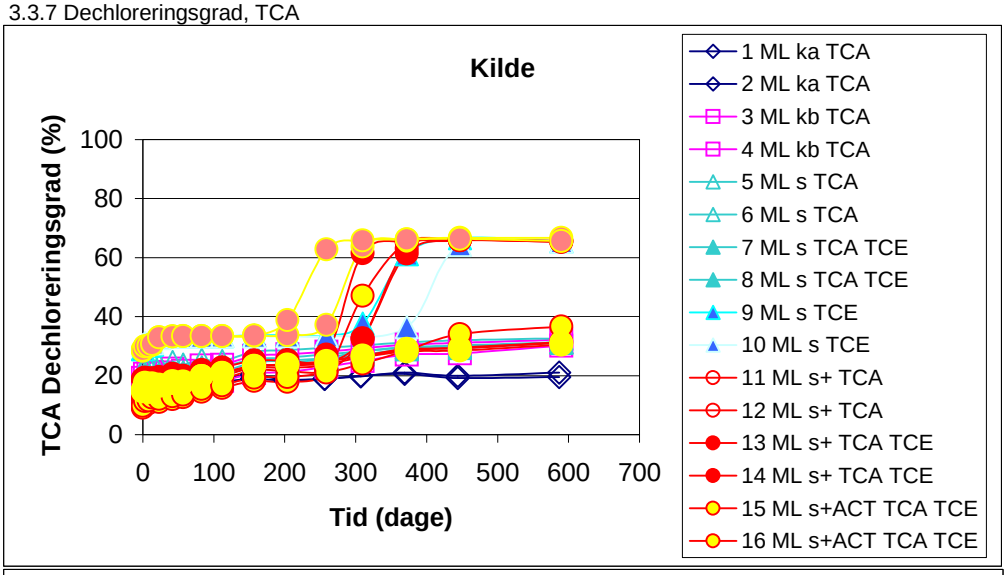


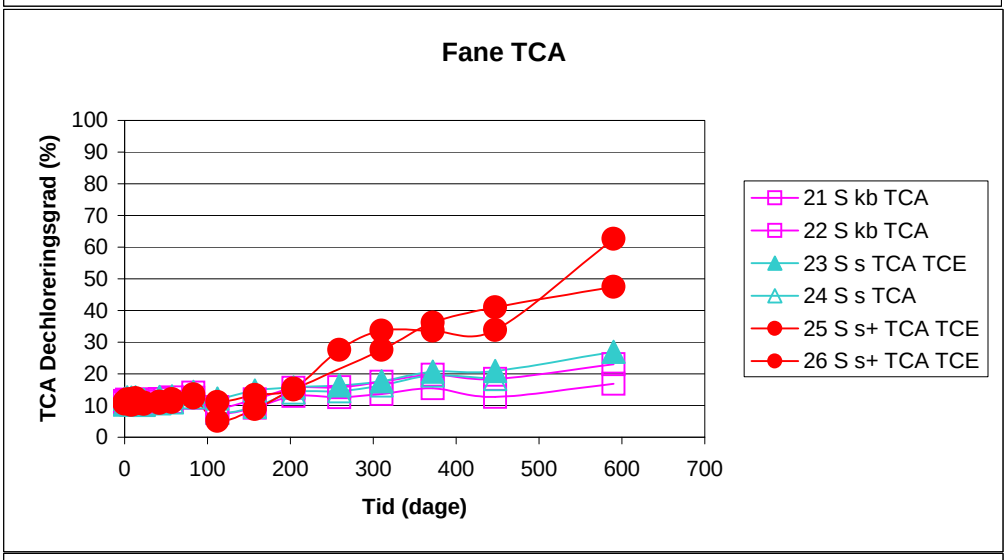


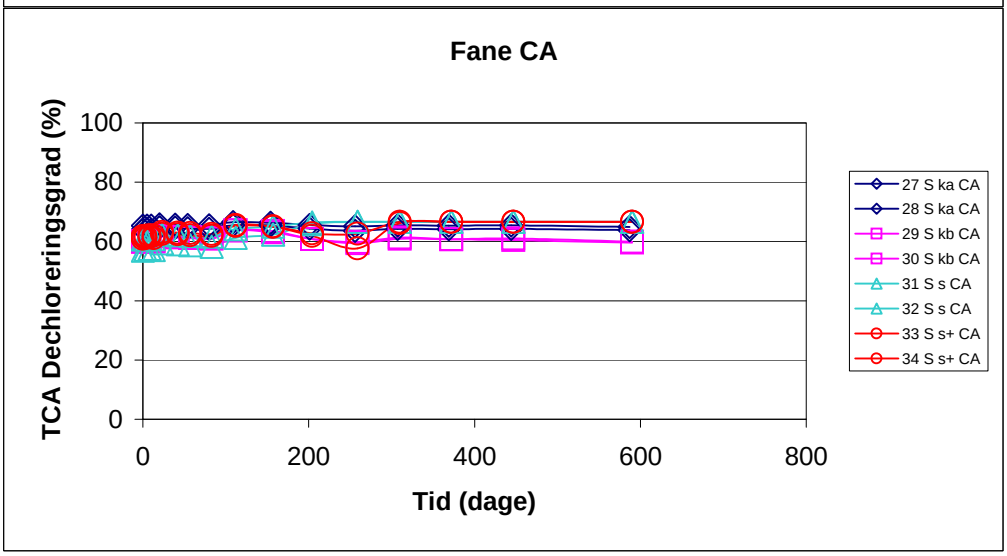




3.3 Vasbyvej, Nedbrydning af chlorerede ethaner
3.3.7 Dechloreringsgrad, TCA

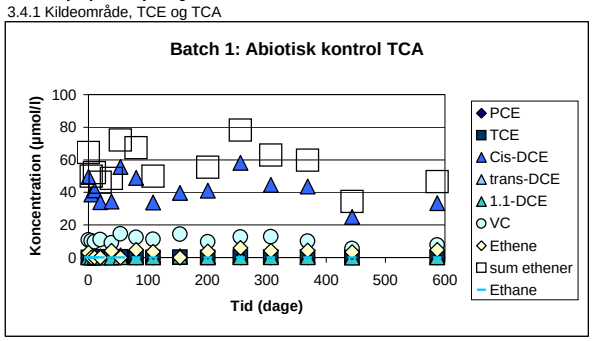


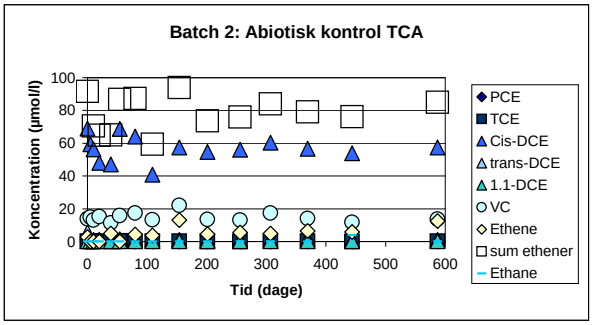


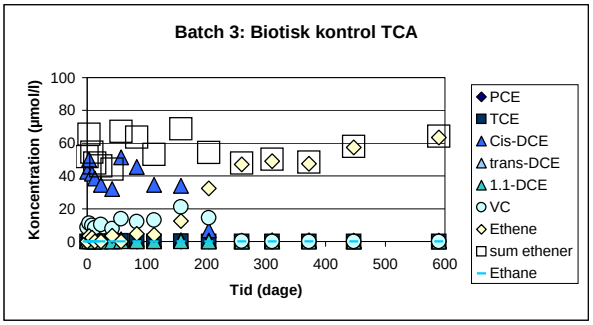


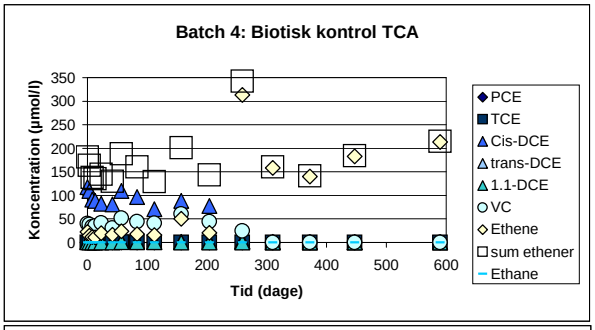
3.4 Vasbyvej, Nedbrydning af chlorerede ethener

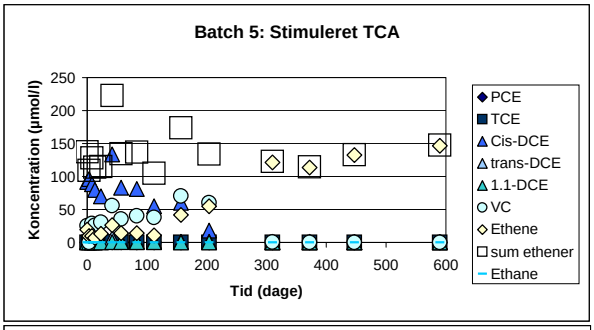
3.4.1 Kildeområde, TCE og TCA

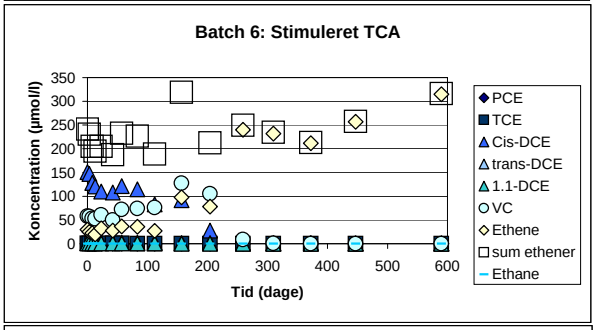


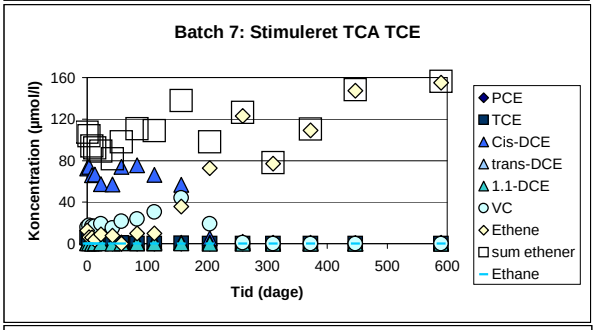


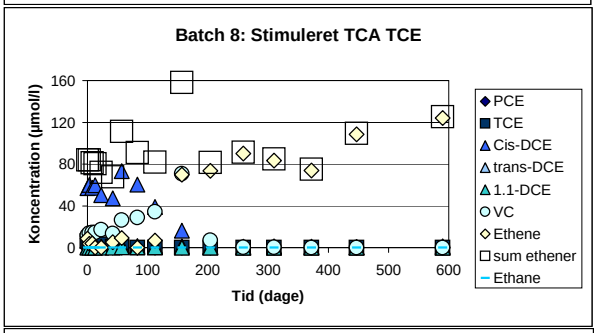


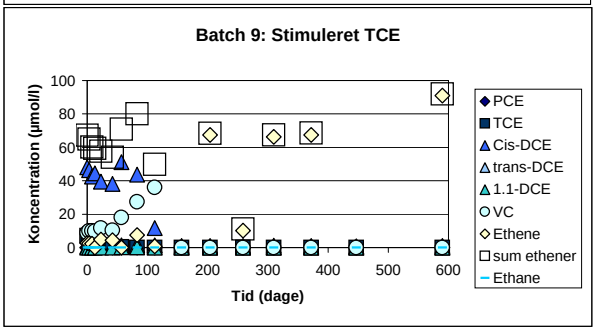


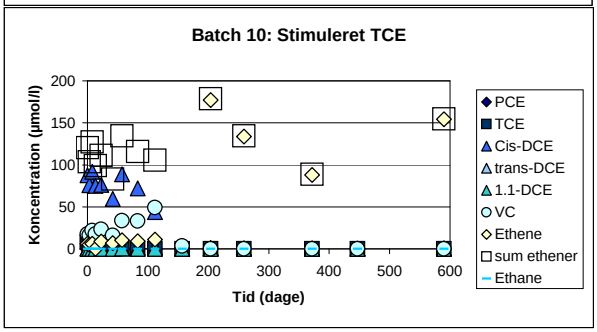




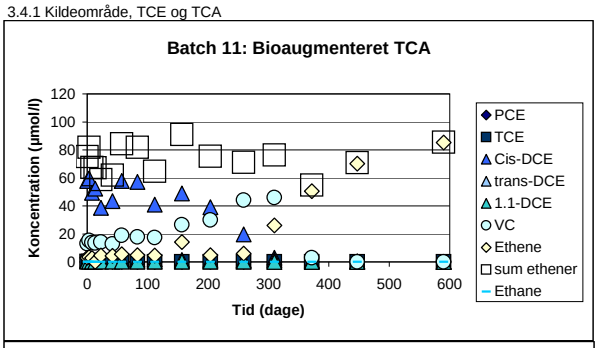


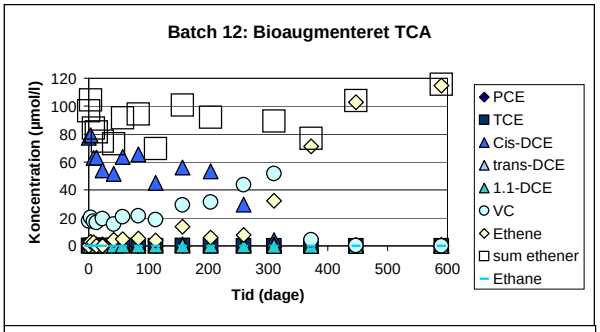


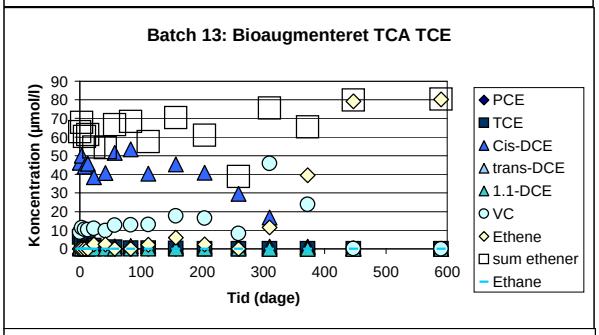


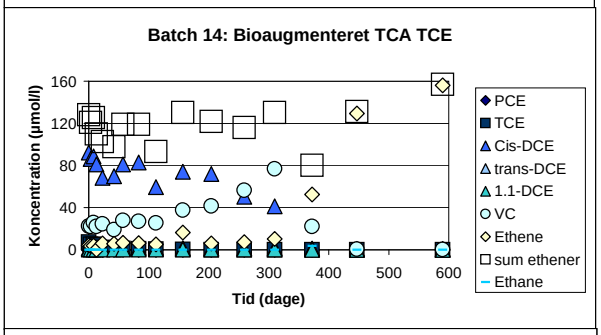


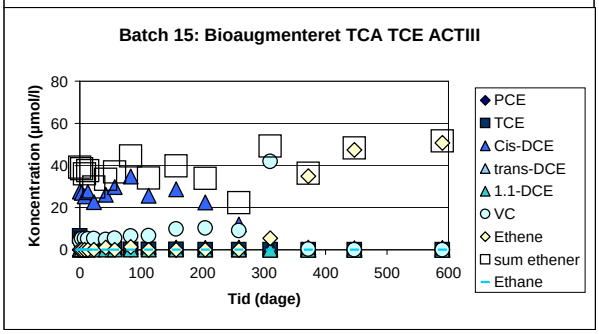
3.4.1 Kildeområde, TCE og TCA

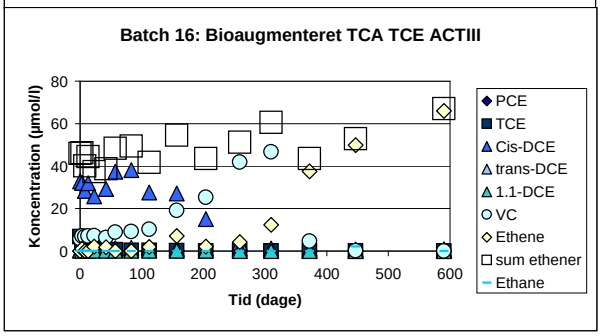


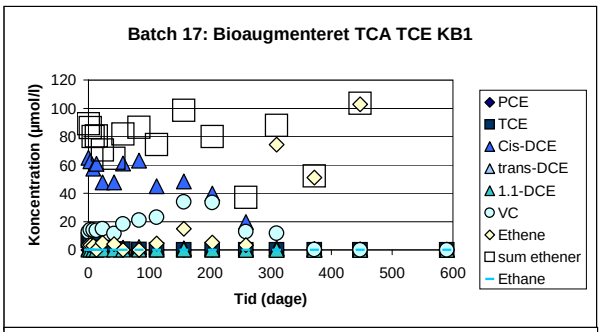


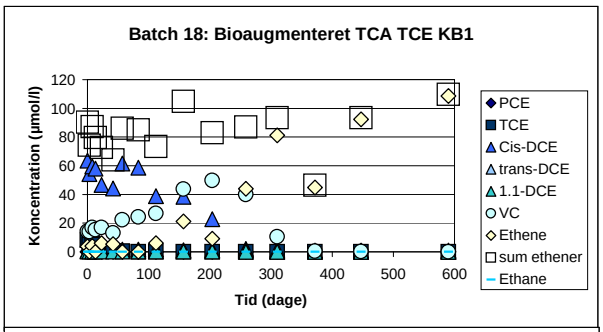


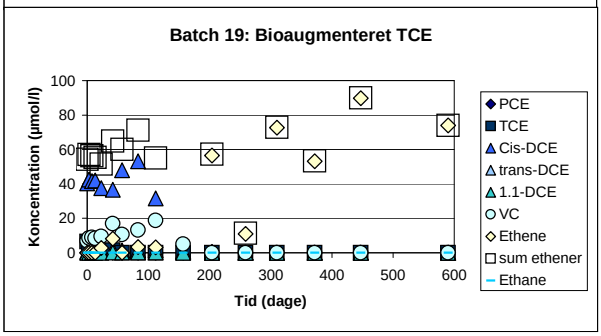


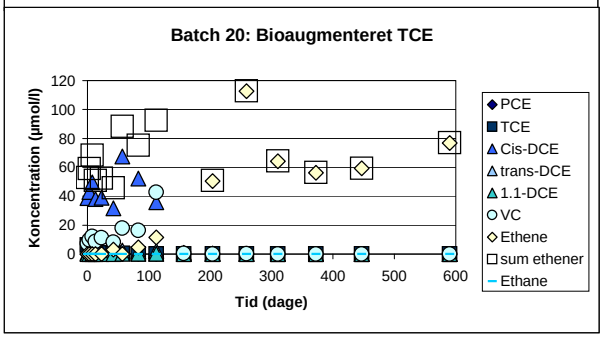




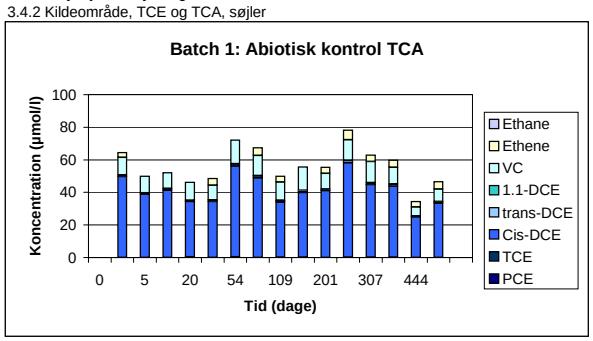


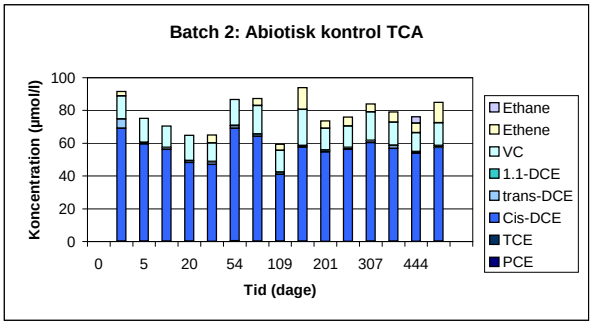


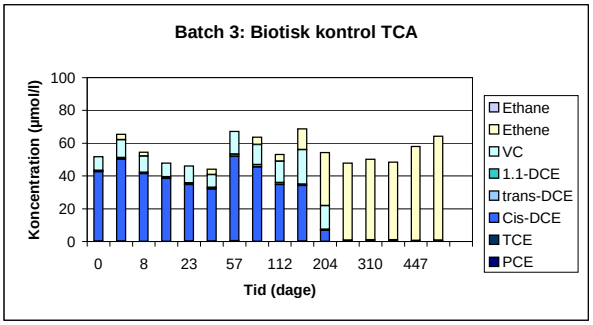


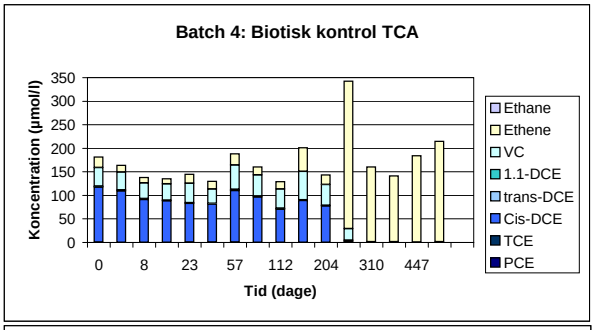


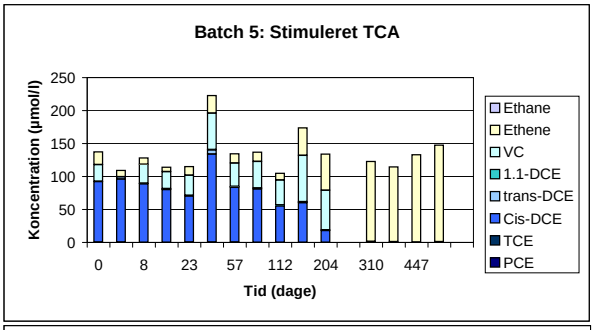
3.4 Vasbyvej, Nedbrydning af chlorerede ethener
3.4.2 Kildeområde, TCE og TCA, søjler

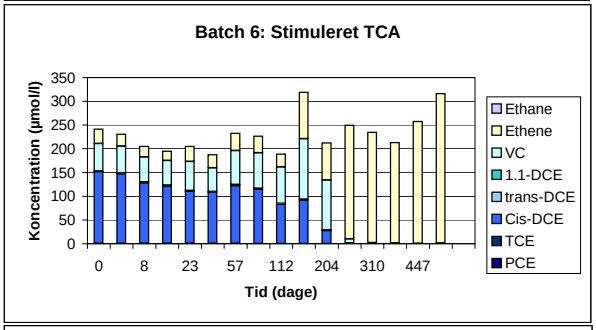


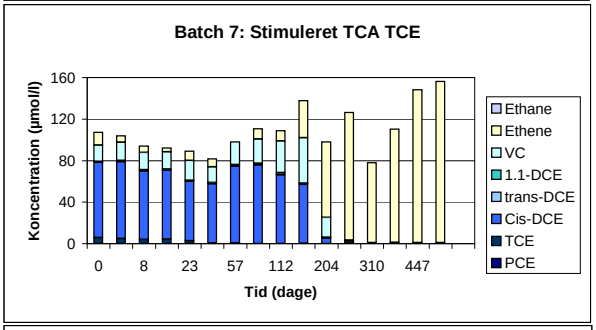


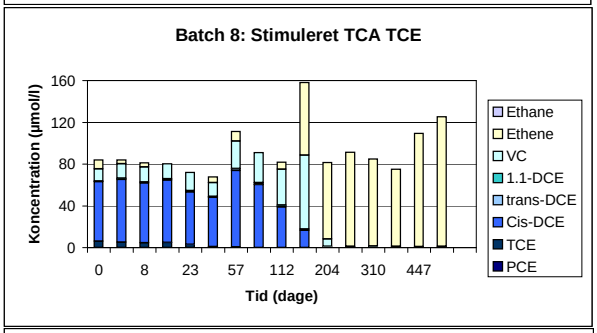


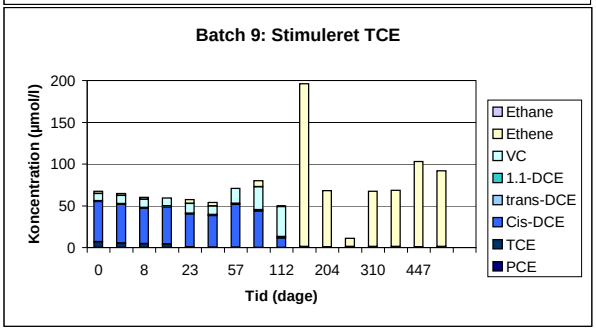


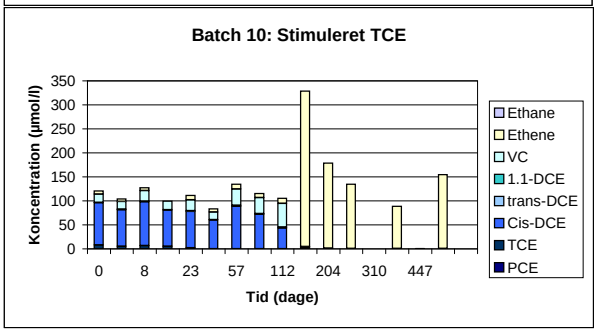




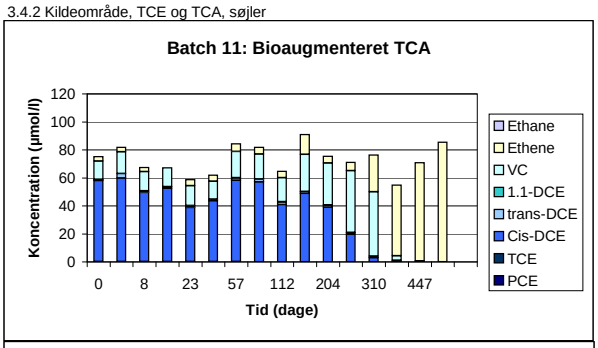


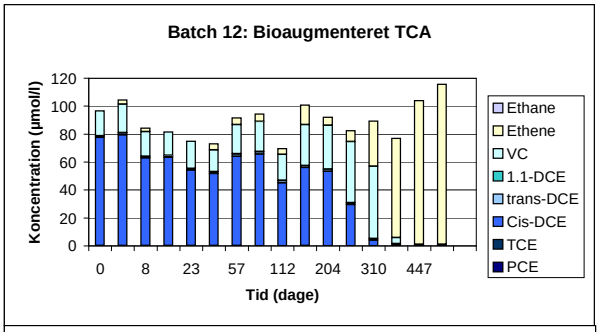


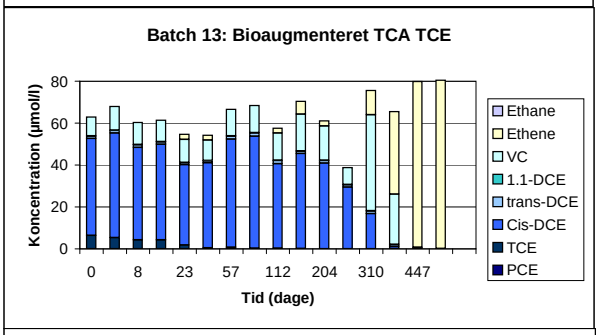


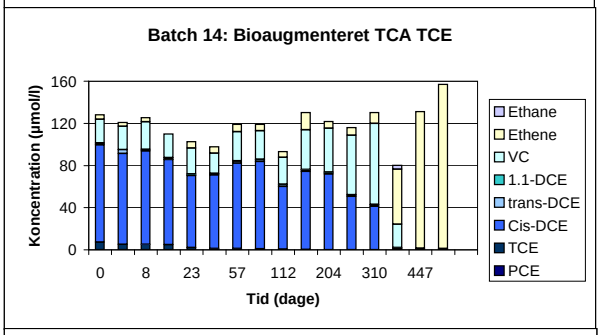


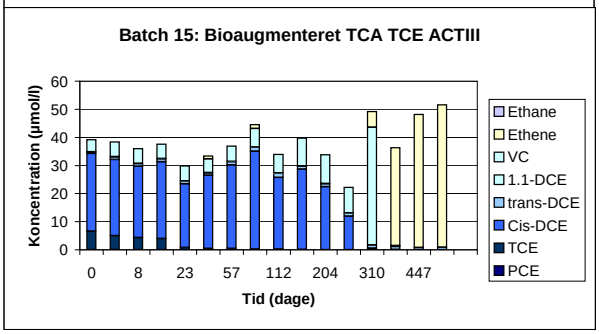
3.4.2 Kildeområde, TCE og TCA, søjler

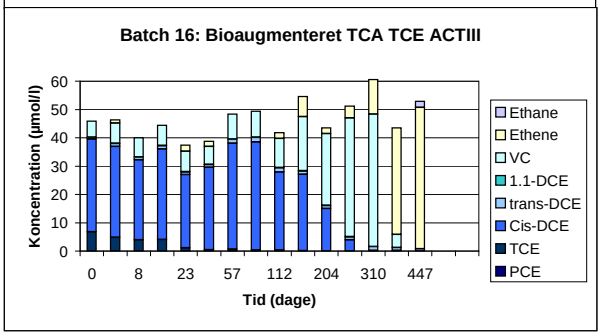


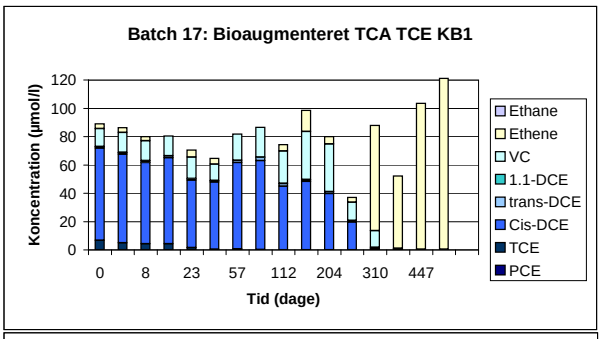


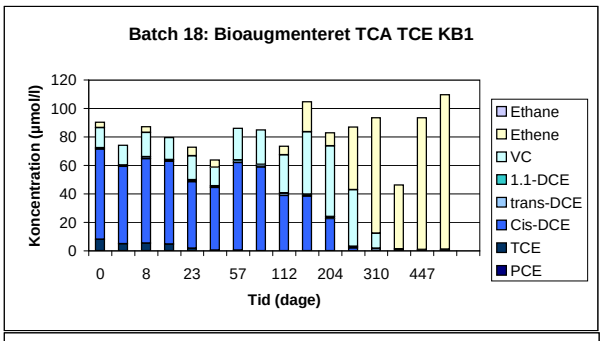


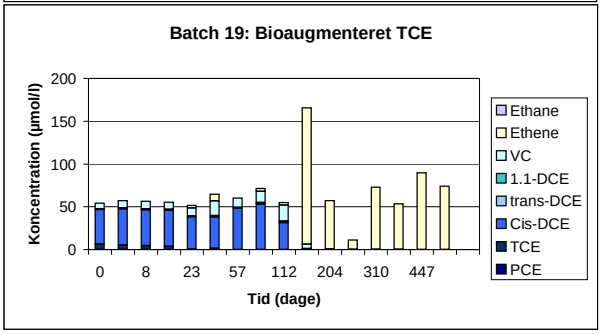


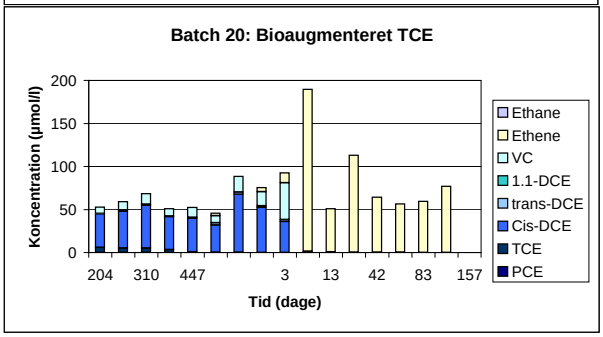




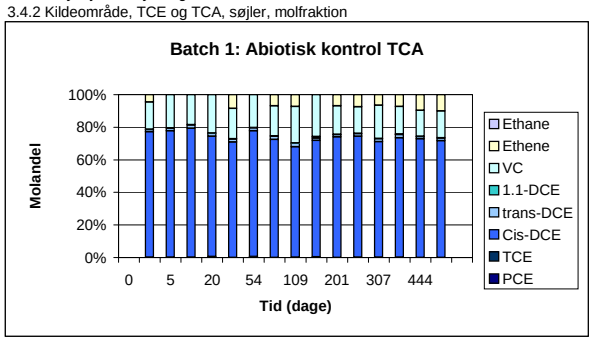


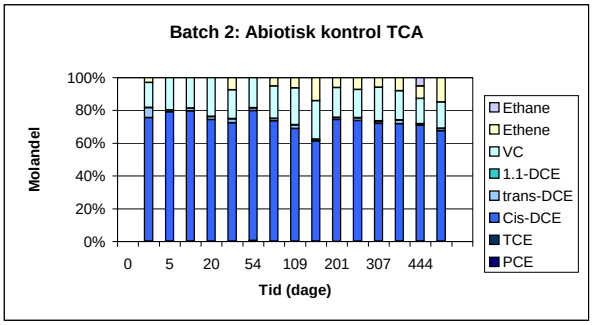


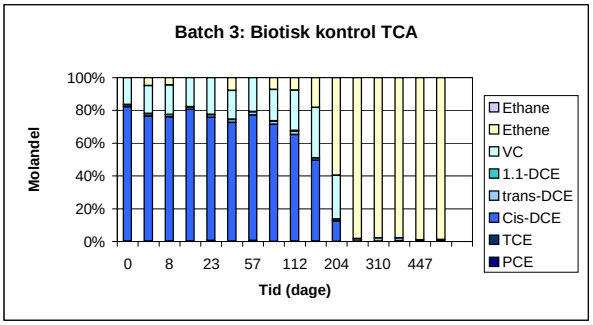


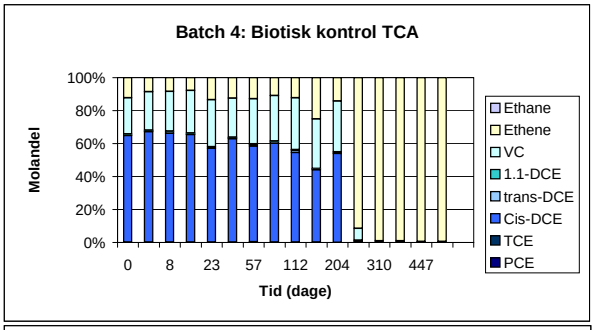


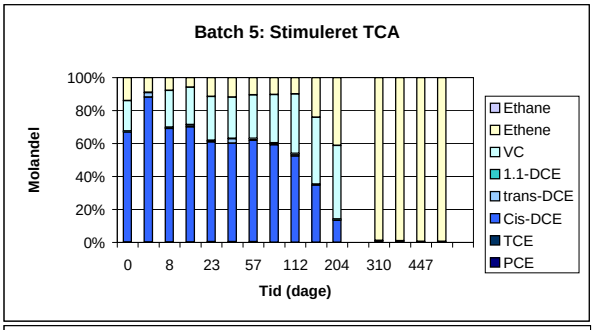
3.4 Vasbyvej, Nedbrydning af chlorerede ethener
3.4.2 Kildeområde, TCE og TCA, søjler, molfraktion

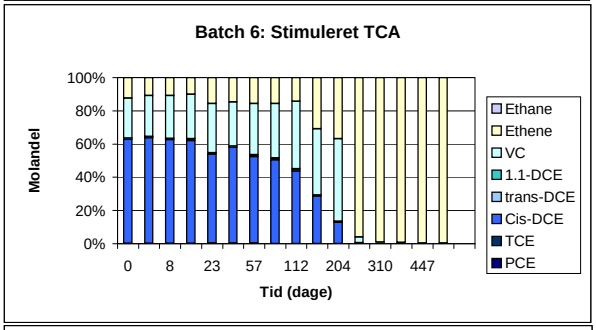


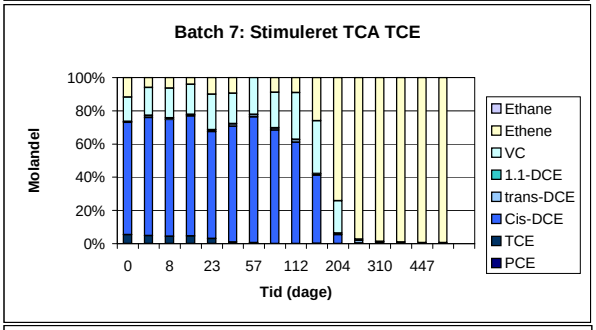


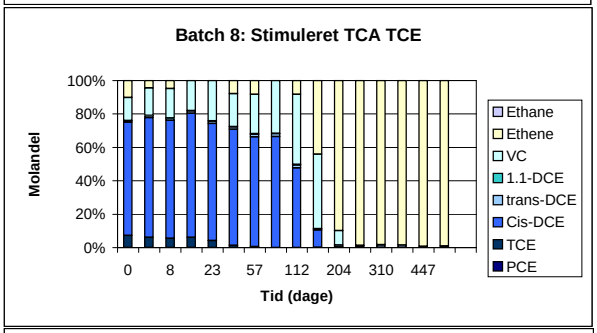


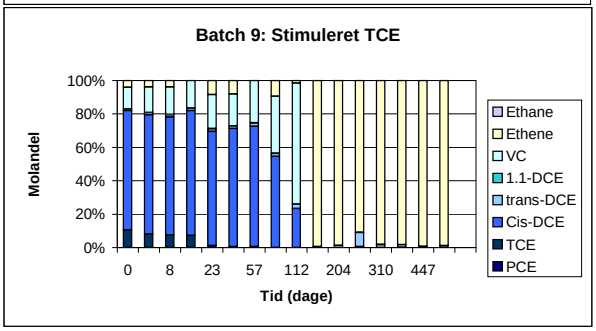


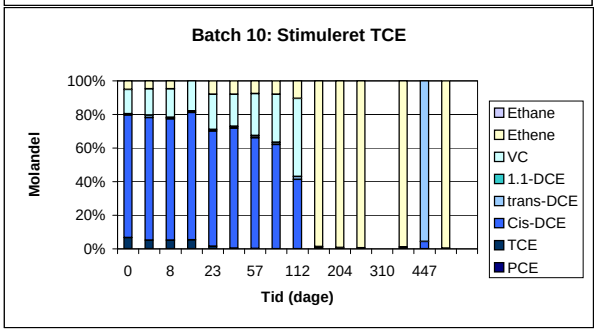




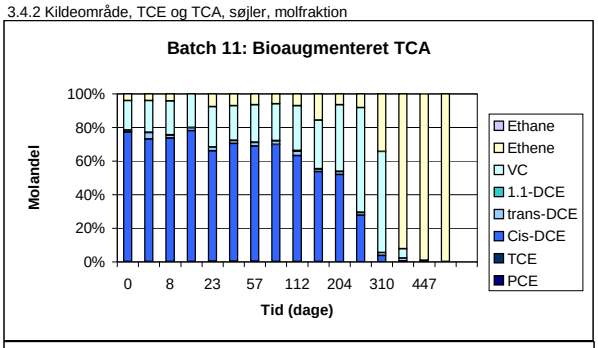


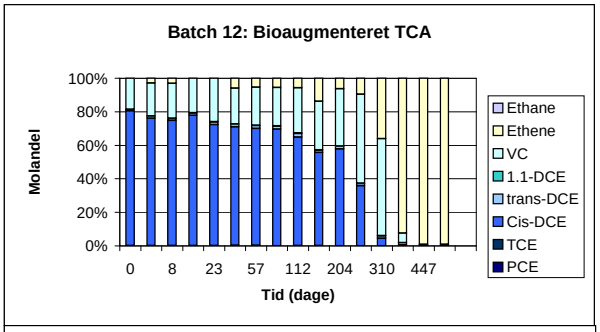


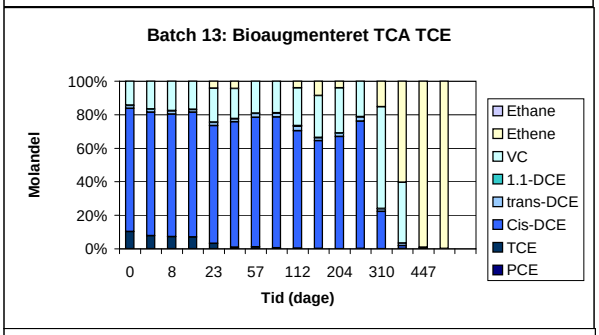


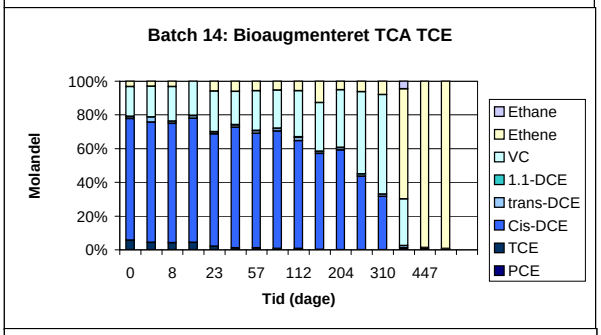


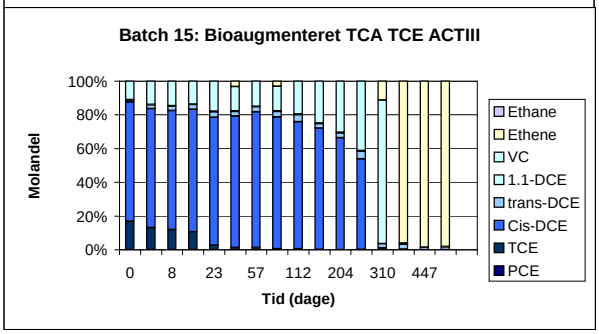
3.4.2 Kildeområde, TCE og TCA, søjler, molfraktion

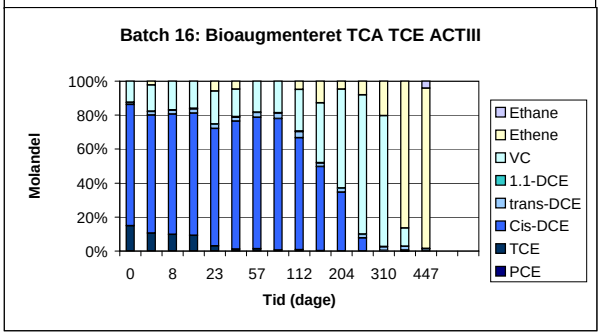


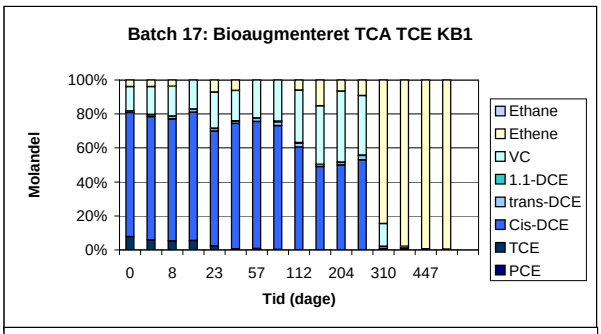


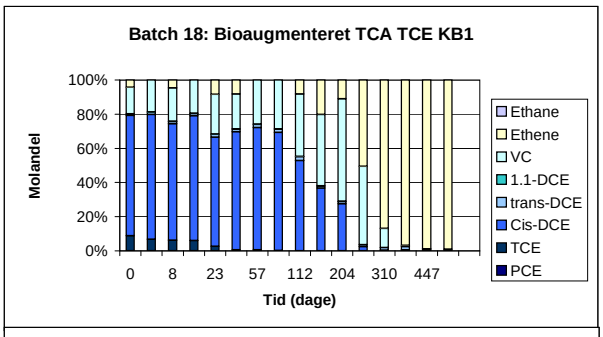


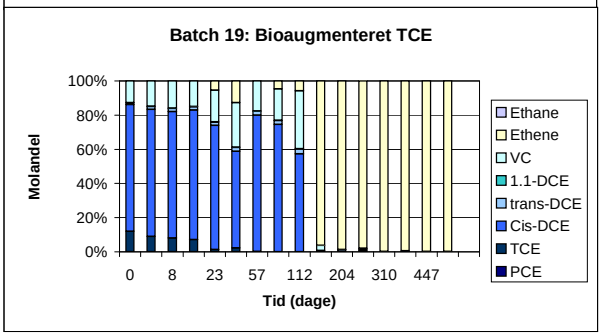


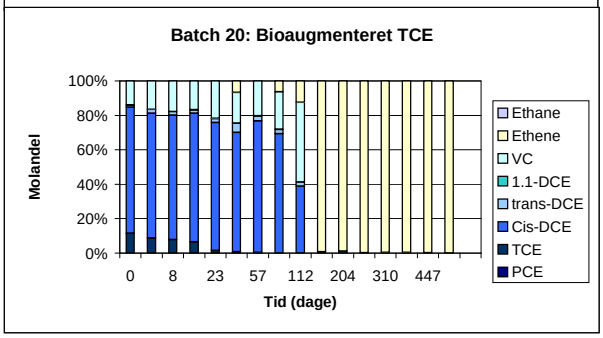






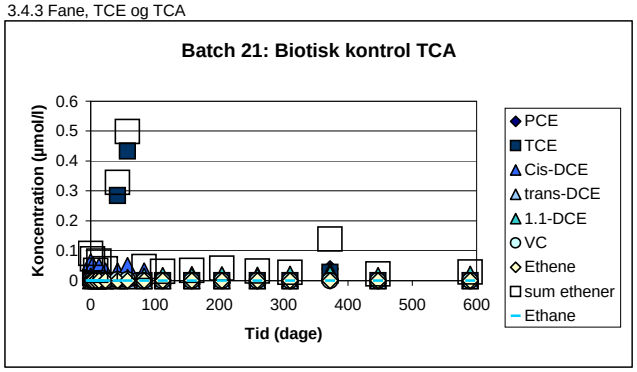


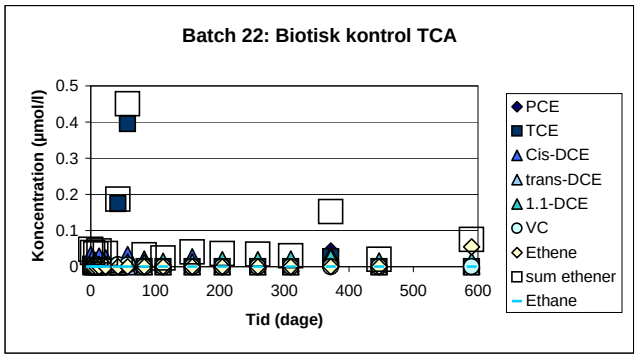


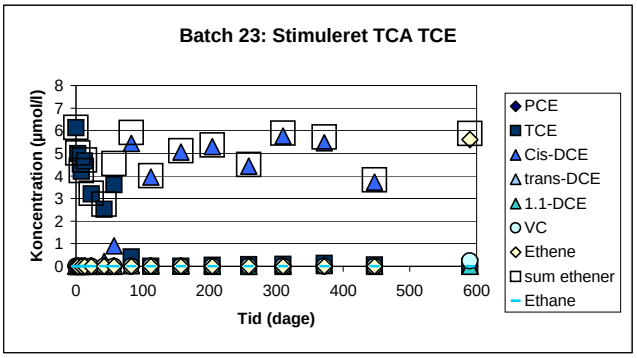


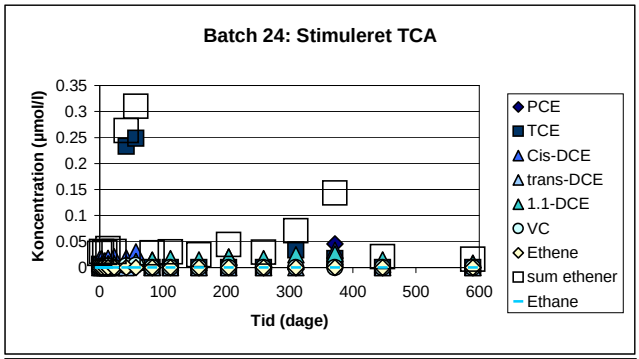
3.4 Vasbyvej, Nedbrydning af chlorerede ethener

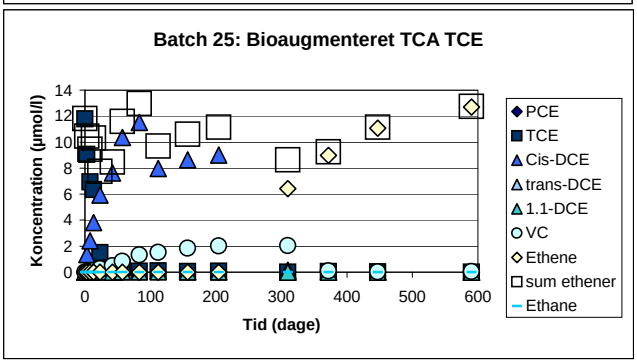
3.4.3 Fane, TCE og TCA

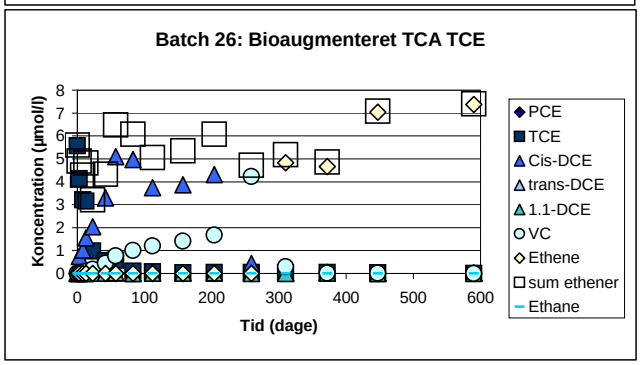






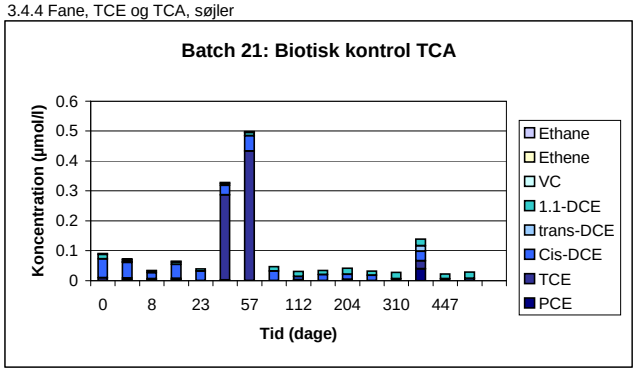


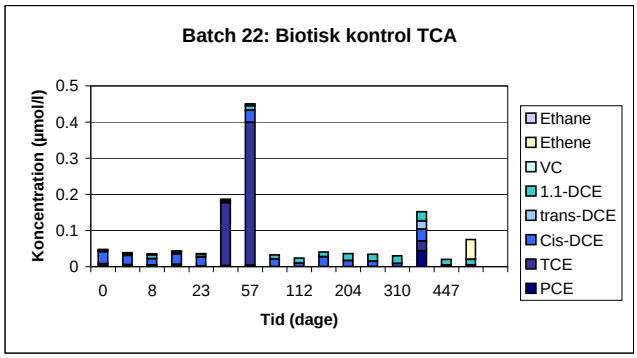


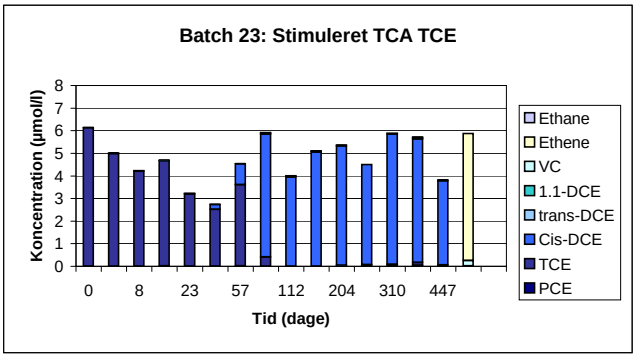


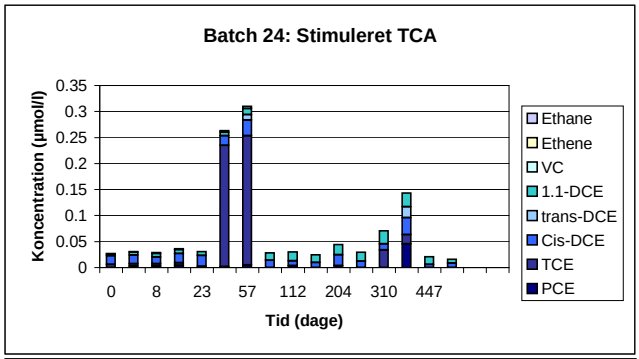
3.4 Vasbyvej, Nedbrydning af chlorerede ethener

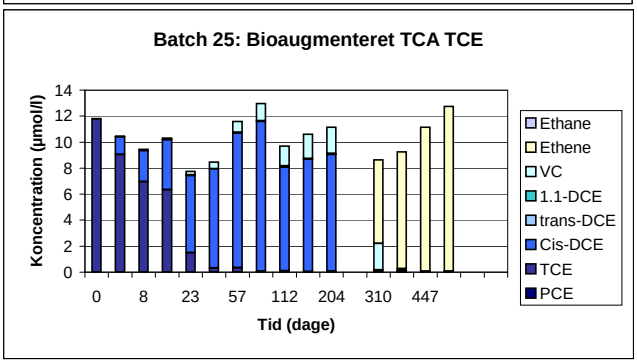
3.4.4 Fane, TCE og TCA, søjler

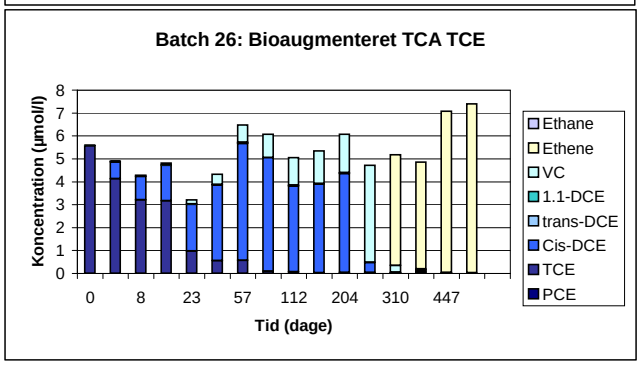




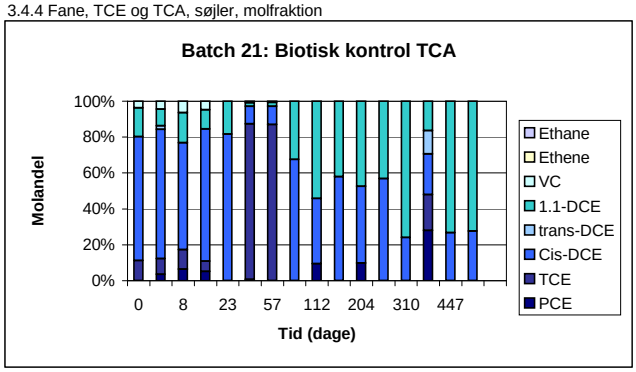


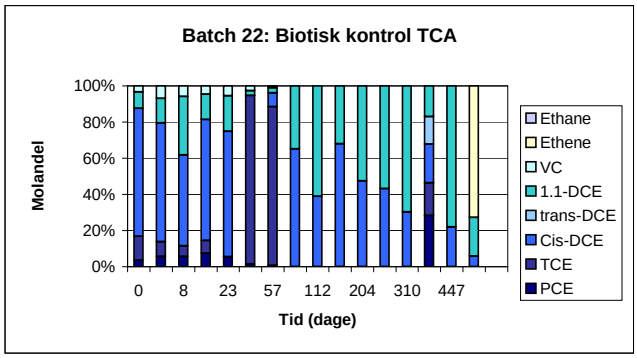


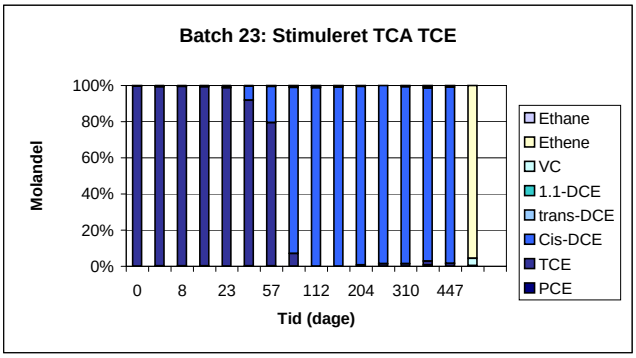


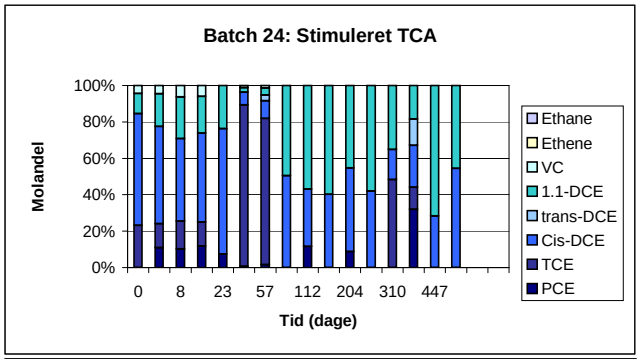


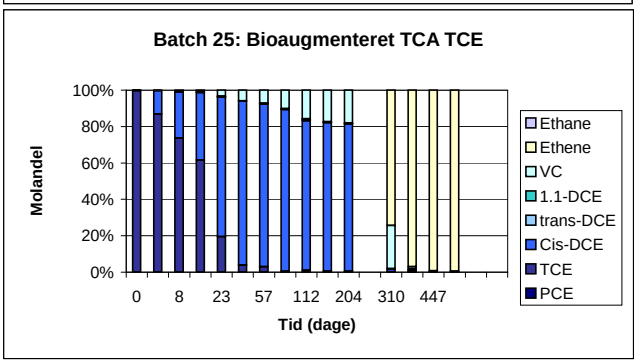
3.4 Vasbyvej, Nedbrydning af chlorerede ethener
3.4.4 Fane, TCE og TCA, søjler, molfraktion

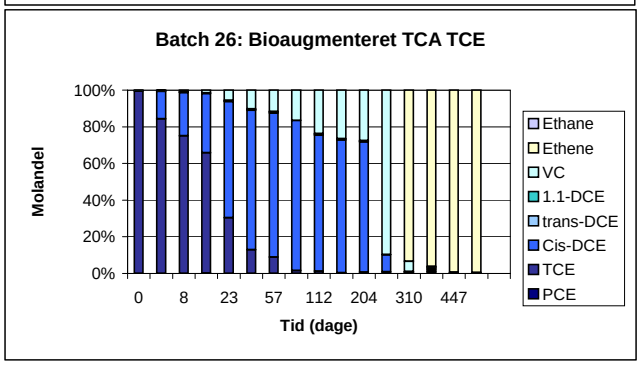






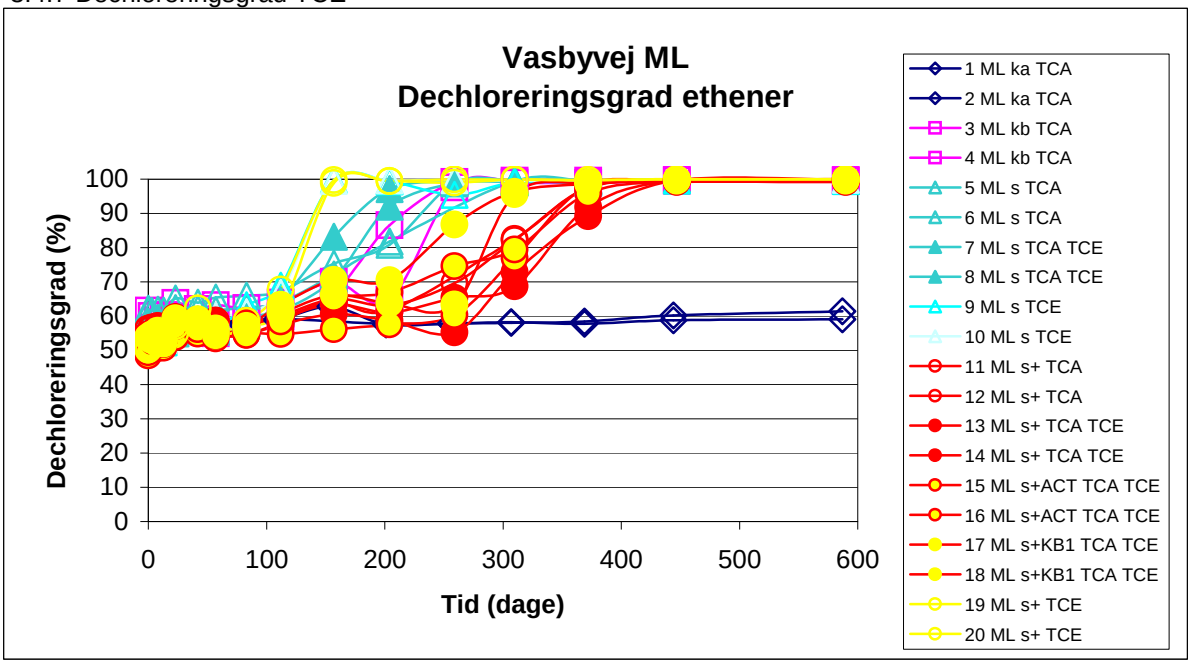


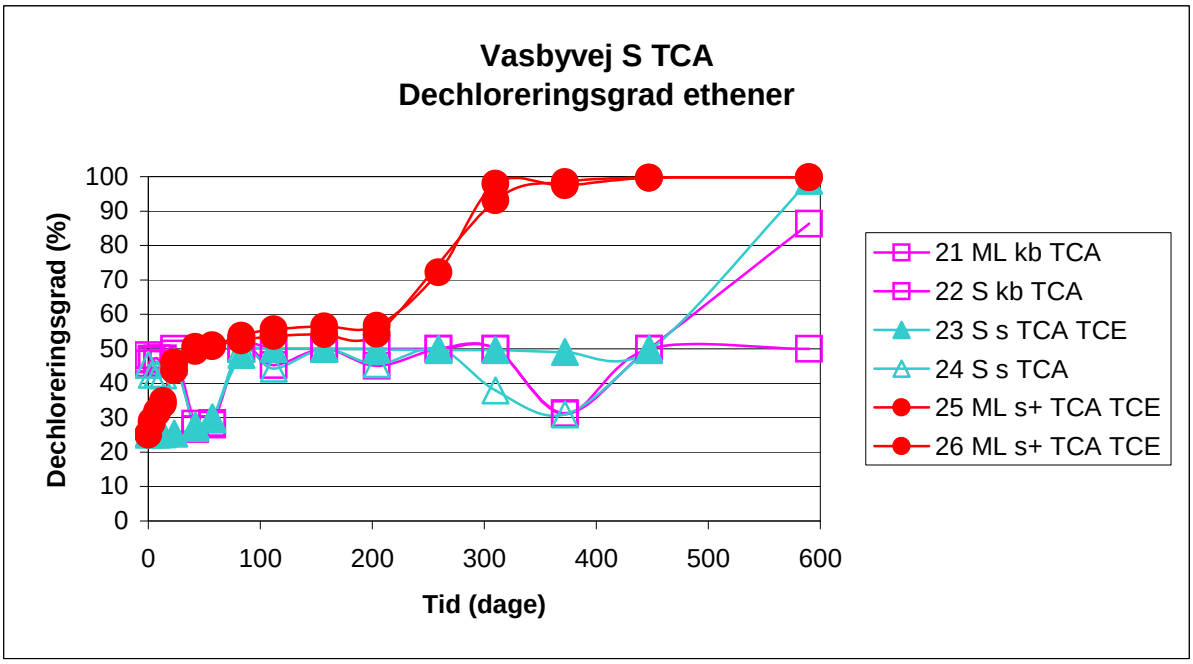


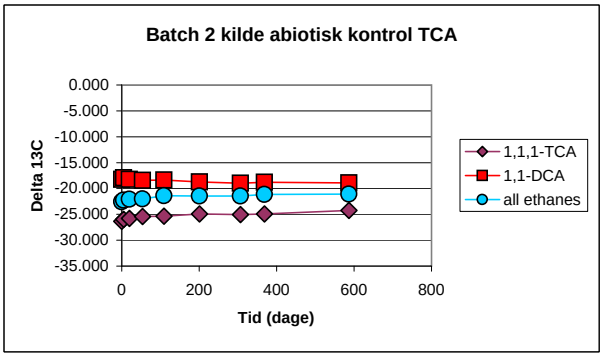


3.4 Vasbyvej, Nedbrydning af chlorerede ethener

3.4.7 Dechloreringsgrad TCE



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Tid (dage)
1,1,1-TCA
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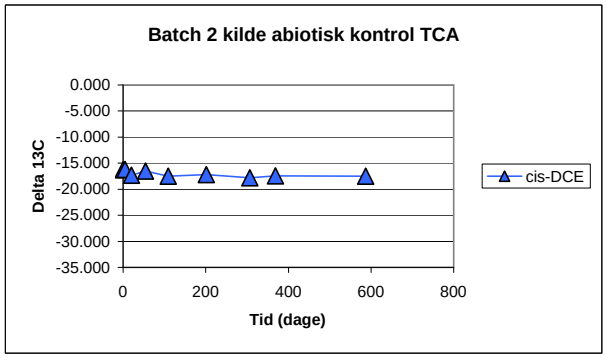
all ethanes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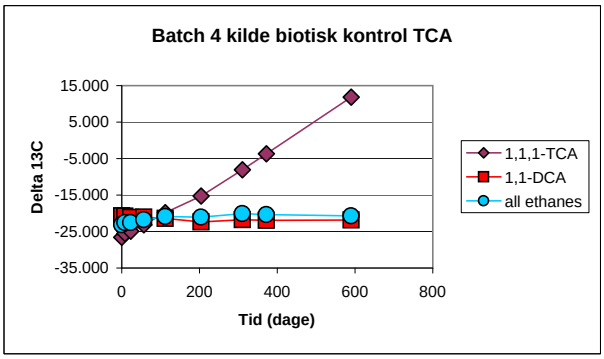
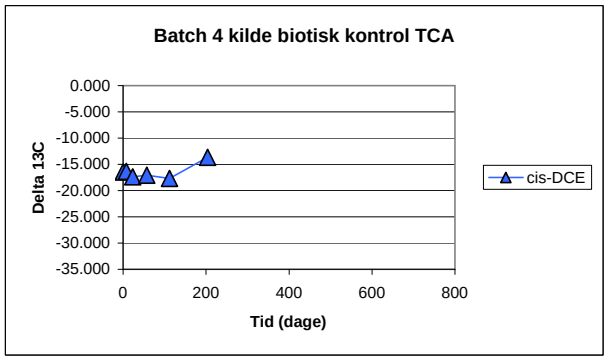
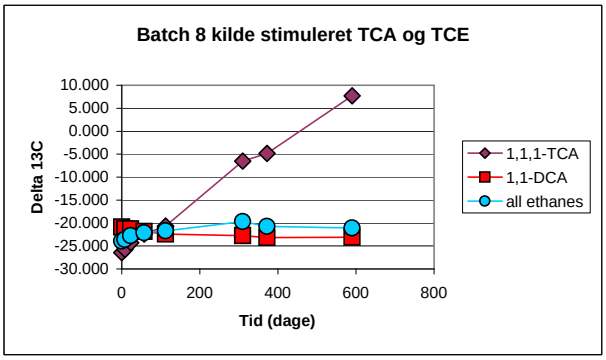
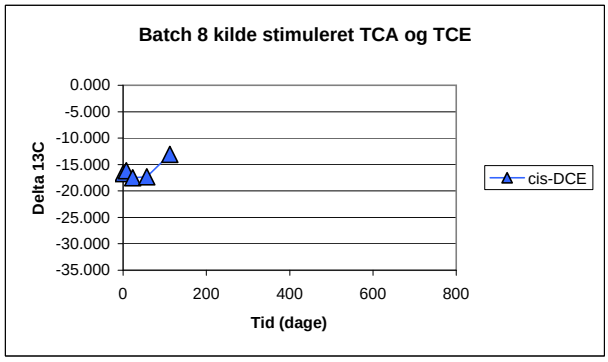
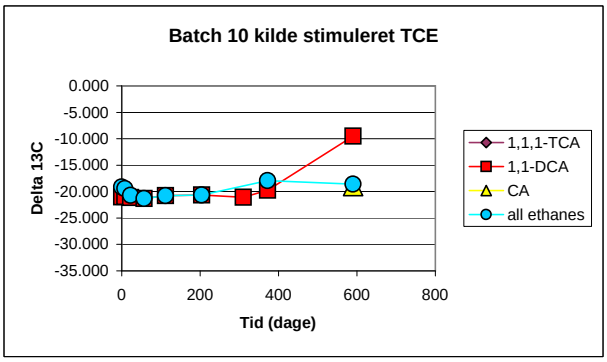
Tid (dage)
cis-DCE

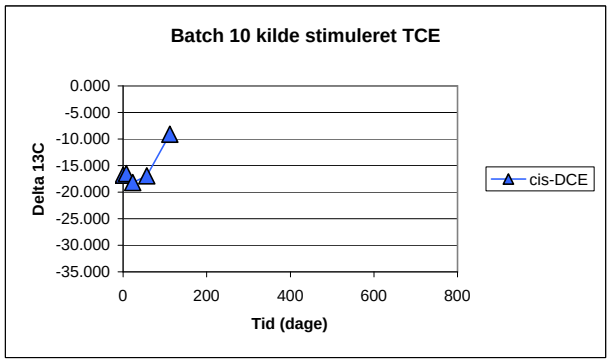

Batch 4 kilde biotisk kontrol TCA
Delta 13C
Tid (dage)
1,1,1-TCA
1,1-DCA
all ethanes

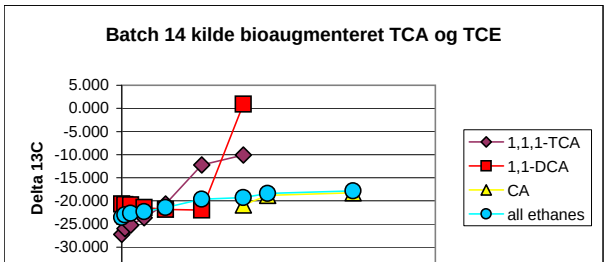

Batch 4 kilde biotisk kontrol TCA
Delta 13C
Tid (dage)
cis-DCE

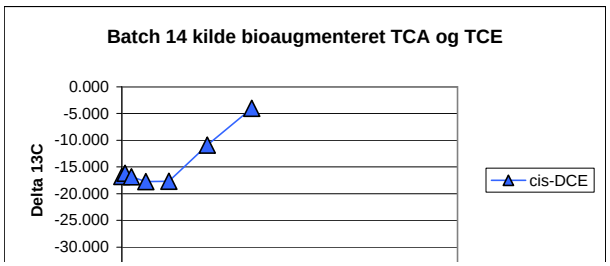

Batch 8 kilde stimuleret TCA og TCE
Delta 13C
Tid (dage)
1,1,1-TCA
1,1-DCA
all ethanes

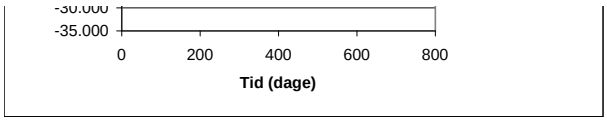

Batch 8 kilde stimuleret TCA og TCE
Delta 13C
Tid (dage)
cis-DCE

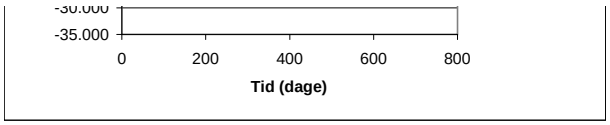

Batch 10 kilde stimuleret TCE
Delta 13C
Tid (dage)
1,1,1-TCA
1,1-DCA
CA
all ethanes

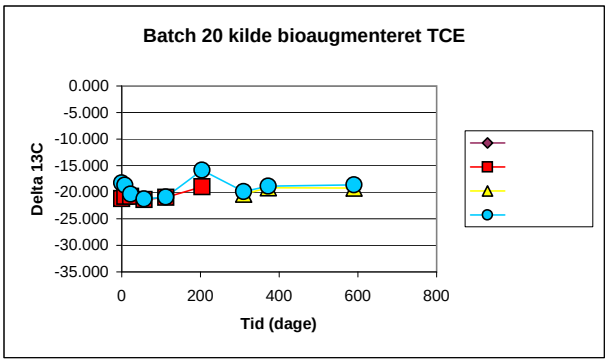

Batch 10 kilde stimuleret TCE
Delta 13C
Tid (dage)
cis-DCE

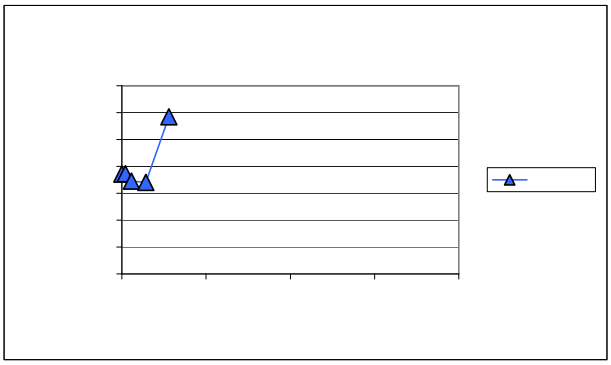

Batch 14 kilde bioaugmenteret TCA og TCE
Delta 13C
1,1,1-TCA
1,1-DCA
CA
all ethanes

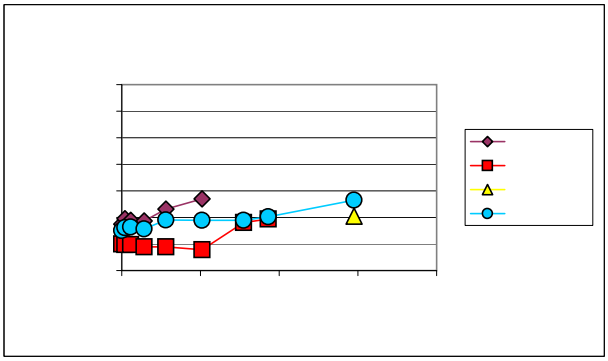

Batch 14 kilde bioaugmenteret TCA og TCE
Delta 13C
cis-DCE

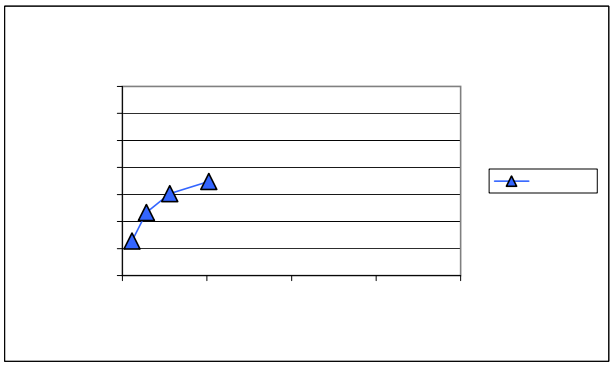

-30.000
-35.000
0
200
400
600
800
Tid (dage)

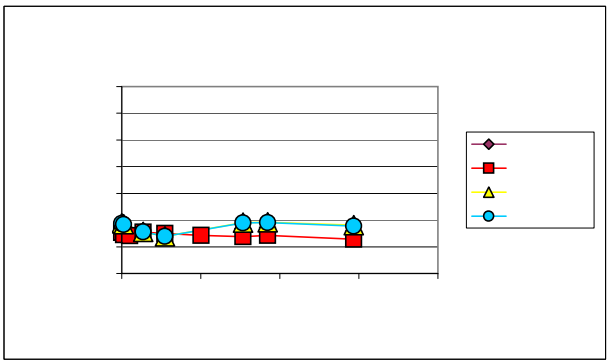

-30.000
-35.000
0
200
400
600
800
Tid (dage)

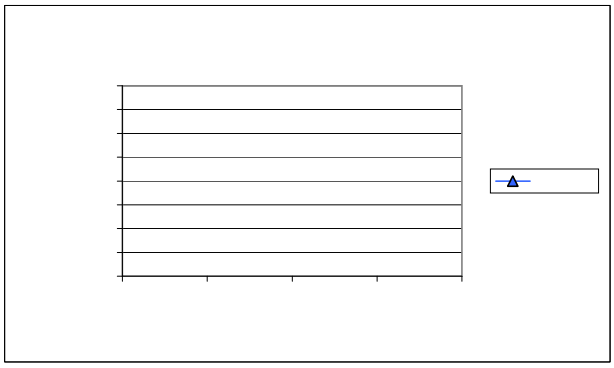

Batch 20 kilde bioaugmenteret TCE
Delta 13C
0.000
-5.000
-10.000
-15.000
-20.000
-25.000
-30.000
-35.000
0
200
400
600
800
Tid (dage)

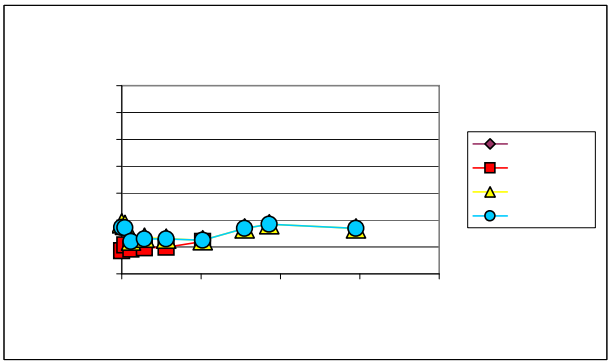


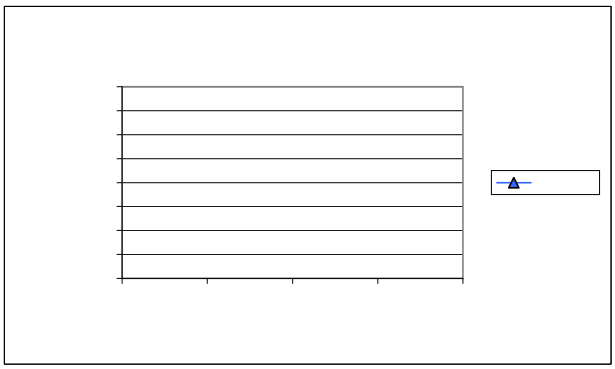


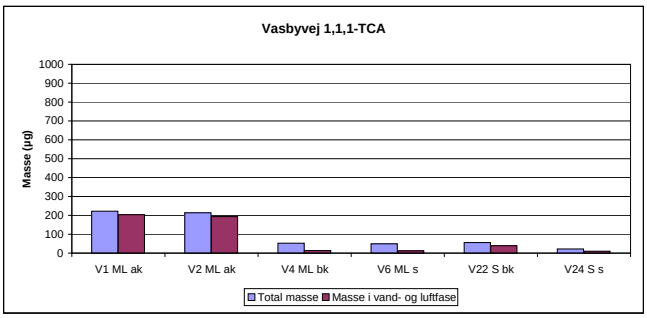


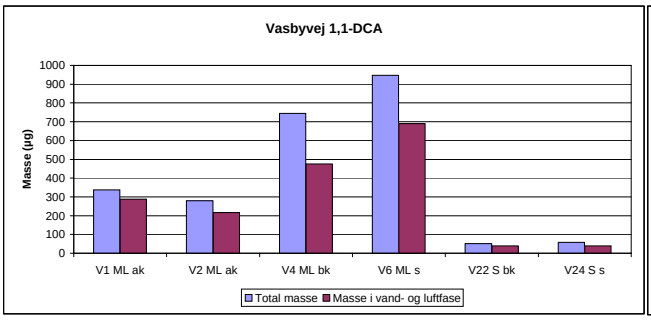


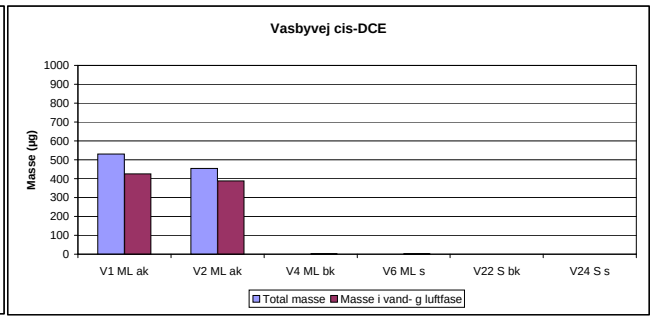


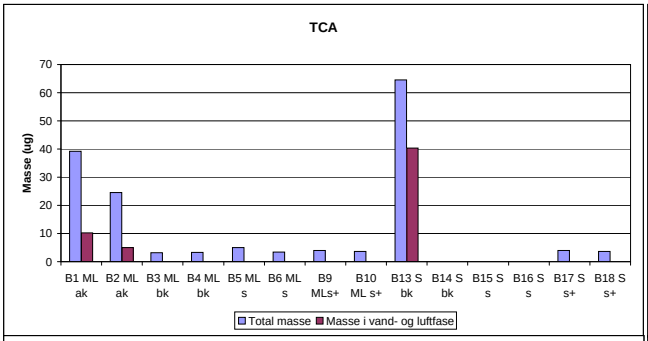


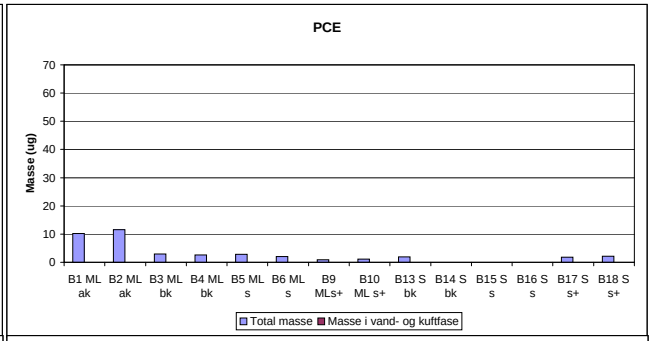


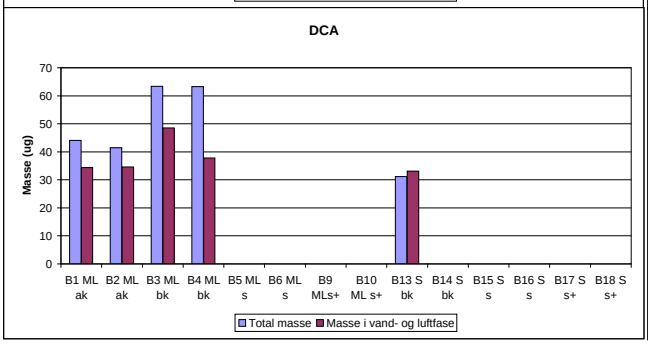

Vasbyvej 1,1,1-TCA
Masse (µg)
1000
900
800
700
600
500
400
300
200
100
0
V1 ML ak
V2 ML ak
V4 ML bk
V6 ML s
V22 S bk
V24 S s
Total masse
Masse i vand- og luftfase

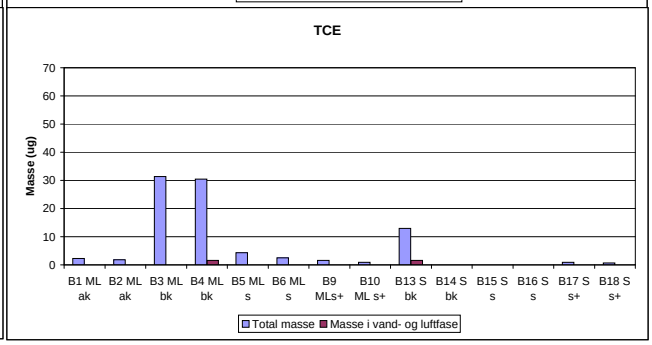

Vasbyvej 1,1-DCA
Masse (µg)
1000
900
800
700
600
500
400
300
200
100
0
V1 ML ak
V2 ML ak
V4 ML bk
V6 ML s
V22 S bk
V24 S s
Total masse
Masse i vand- og luftfase

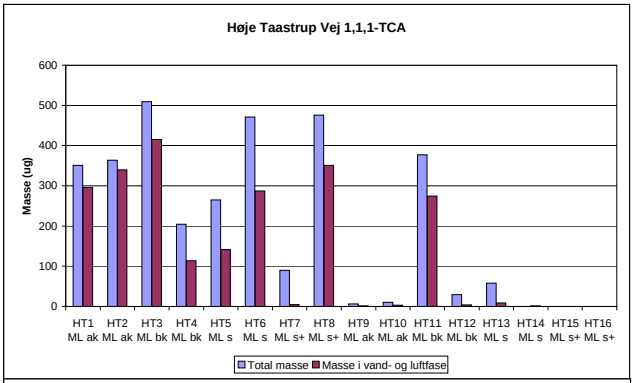

Vasbyvej cis-DCE
Masse (µg)
1000
900
800
700
600
500
400
300
200
100
0
V1 ML ak
V2 ML ak
V4 ML bk
V6 ML s
V22 S bk
V24 S s
Total masse
Masse i vand- g luftfase

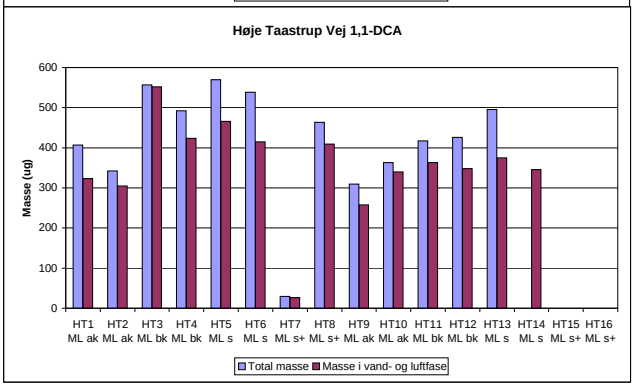

TCA
Masse (ug)
70
60
50
40
30
20
10
0
B1 ML ak
B2 ML ak
B3 ML bk
B4 ML bk
B5 ML s
B6 ML s
B9 MLs+
B10 ML s+
B13 S bk
B14 S bk
B15 S s
B16 S s
B17 S s+
B18 S s+
Total masse
Masse i vand- og luftfase

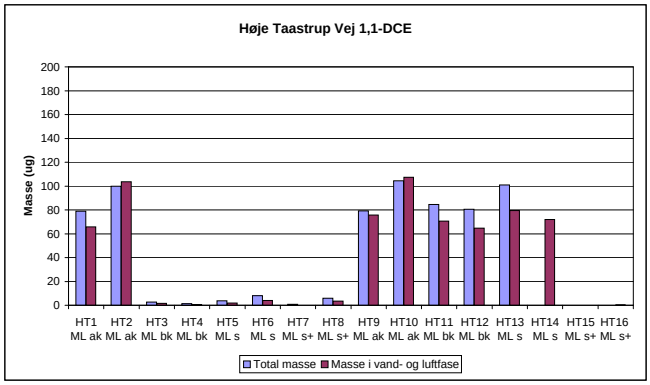

PCE
Masse (ug)
70
60
50
40
30
20
10
0
B1 ML ak
B2 ML ak
B3 ML bk
B4 ML bk
B5 ML s
B6 ML s
B9 MLs+
B10 ML s+
B13 S bk
B14 S bk
B15 S s
B16 S s
B17 S s+
B18 S s+
Total masse
Masse i vand- og kuftfase


DCA
Masse (ug)
70
60
50
40
30
20
10
0
B1 ML ak
B2 ML ak
B3 ML bk
B4 ML bk
B5 ML s
B6 ML s
B9 MLs+
B10 ML s+
B13 S bk
B14 S bk
B15 S s
B16 S s
B17 S s+
B18 S s+
Total masse
Masse i vand- og luftfase


TCE
Masse (ug)
70
60
50
40
30
20
10
0
B1 ML ak
B2 ML ak
B3 ML bk
B4 ML bk
B5 ML s
B6 ML s
B9 MLs+
B10 ML s+
B13 S bk
B14 S bk
B15 S s
B16 S s
B17 S s+
B18 S s+
Total masse
Masse i vand- og luftfase


Høje Taastrup Vej 1,1,1-TCA
Masse (ug)
600
500
400
300
200
100
0
HT1 ML ak
HT2 ML ak
HT3 ML bk
HT4 ML bk
HT5 ML s
HT6 ML s
HT7 ML s+
HT8 ML s+
HT9 ML ak
HT10 ML ak
HT11 ML bk
HT12 ML bk
HT13 ML s
HT14 ML s
HT15 ML s+
HT16 ML s+
Total masse
Masse i vand- og luftfase


Høje Taastrup Vej 1,1-DCA
Masse (ug)
600
500
400
300
200
100
0
HT1 ML ak
HT2 ML ak
HT3 ML bk
HT4 ML bk
HT5 ML s
HT6 ML s
HT7 ML s+
HT8 ML s+
HT9 ML ak
HT10 ML ak
HT11 ML bk
HT12 ML bk
HT13 ML s
HT14 ML s
HT15 ML s+
HT16 ML s+
Total masse
Masse i vand- og luftfase


Høje Taastrup Vej 1,1-DCE
Masse (ug)
200
180
160
140
120
100
80
60
40
20
0
HT1 ML ak
HT2 ML ak
HT3 ML bk
HT4 ML bk
HT5 ML s
HT6 ML s
HT7 ML s+
HT8 ML s+
HT9 ML ak
HT10 ML ak
HT11 ML bk
HT12 ML bk
HT13 ML s
HT14 ML s
HT15 ML s+
HT16 ML s+
Total masse
Masse i vand- og luftfase