Water chemistry at NJV3

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Nordjyllandsværket Unit 3, NJV3

- USC once-through boiler
  - Double reheat
- Optimised water chemistry at design:
  - Conditioning – Oxygenated Treatment (OT)
  - Condensate polishing – ion exchange, C-A-C concept
  - Monitoring of acid conductivity in preheater drain

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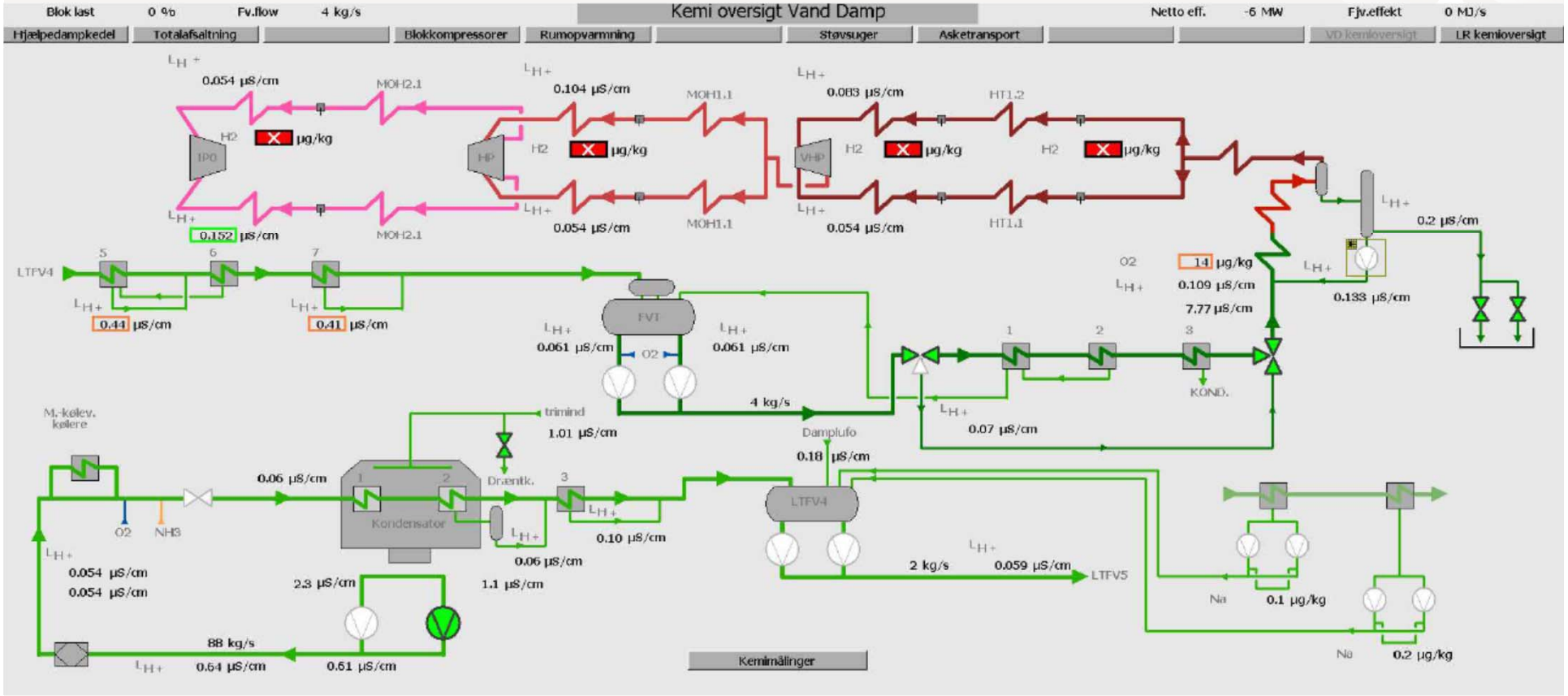
Blok last
0 %
Fv.flow
4 kg/s
Kemi oversigt Vand Damp
Netto eff.
-6 MW
Fjv.effekt
0 MJ/s
Hjælpedampkedel
Totalafsaltning
Blokkompressorer
Rumopvarmning
Støvsuger
Asketransport
VD kemioversigt
LR kemioversigt
0.054 µS/cm
MOH2.1
0.104 µS/cm
MOH1.1
0.083 µS/cm
HT1.2
IPO
HP
VHP
H2
µg/kg
0.152 µS/cm
0.054 µS/cm
HT1.1
0.2 µS/cm
LTFV4
0.44 µS/cm
0.41 µS/cm
FVT
0.061 µS/cm
O2
14 µg/kg
0.109 µS/cm
7.77 µS/cm
0.133 µS/cm
KOND.
4 kg/s
0.07 µS/cm
trimind
1.01 µS/cm
Damplufo
0.18 µS/cm
M.-kølev. kølere
0.06 µS/cm
Kondensator
Dræntk.
0.10 µS/cm
NH3
0.06 µS/cm
1.1 µS/cm
2.3 µS/cm
2 kg/s
0.059 µS/cm
LTFV5
Na
0.1 µg/kg
0.2 µg/kg
88 kg/s
0.64 µS/cm
0.61 µS/cm
Kemimålinger

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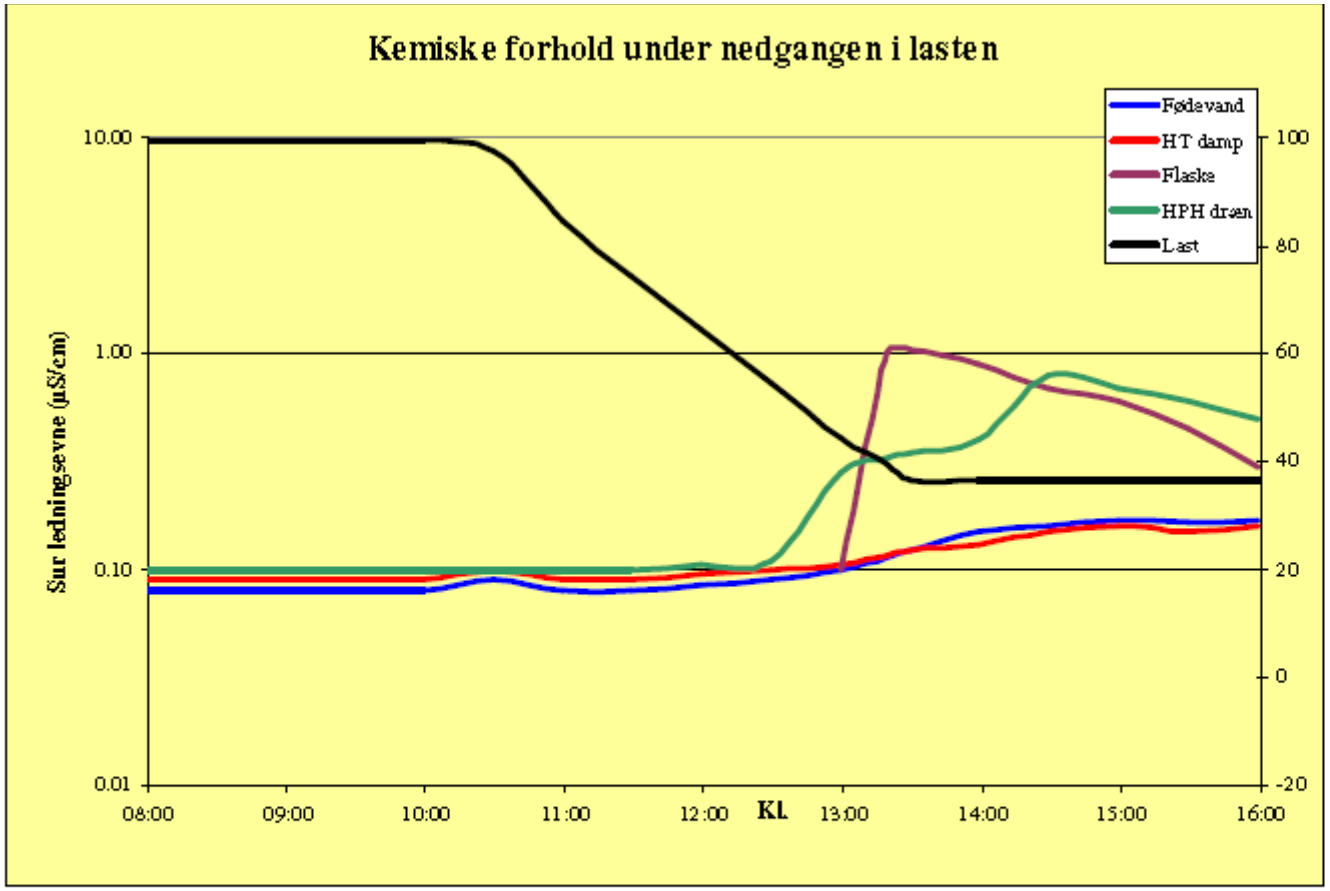

Ref. Karol Daucik,
Elsam/Dong Energy

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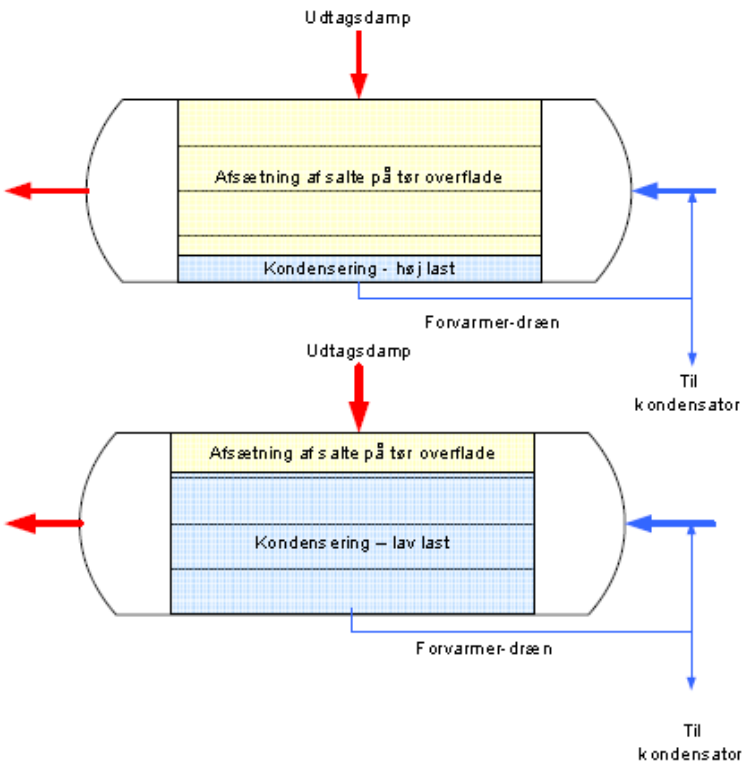
Nedgang i last



Under høj last er størstedelen af overfladerne i HT-forvarmere tørre

Salte – uanset dampkvalitet – afsættes på de tørre overflader i ganske små mængder

Når lasten går ned, befugtes en større del af overfladerne – salte opløses i kondensatet og forurener dette

Hvis kondensatet ledes til fødevand, forurenes dette

Hvis kondensatet ledes til kondensator, holdes systemet rent og saltene fjernes i KR-anlæg

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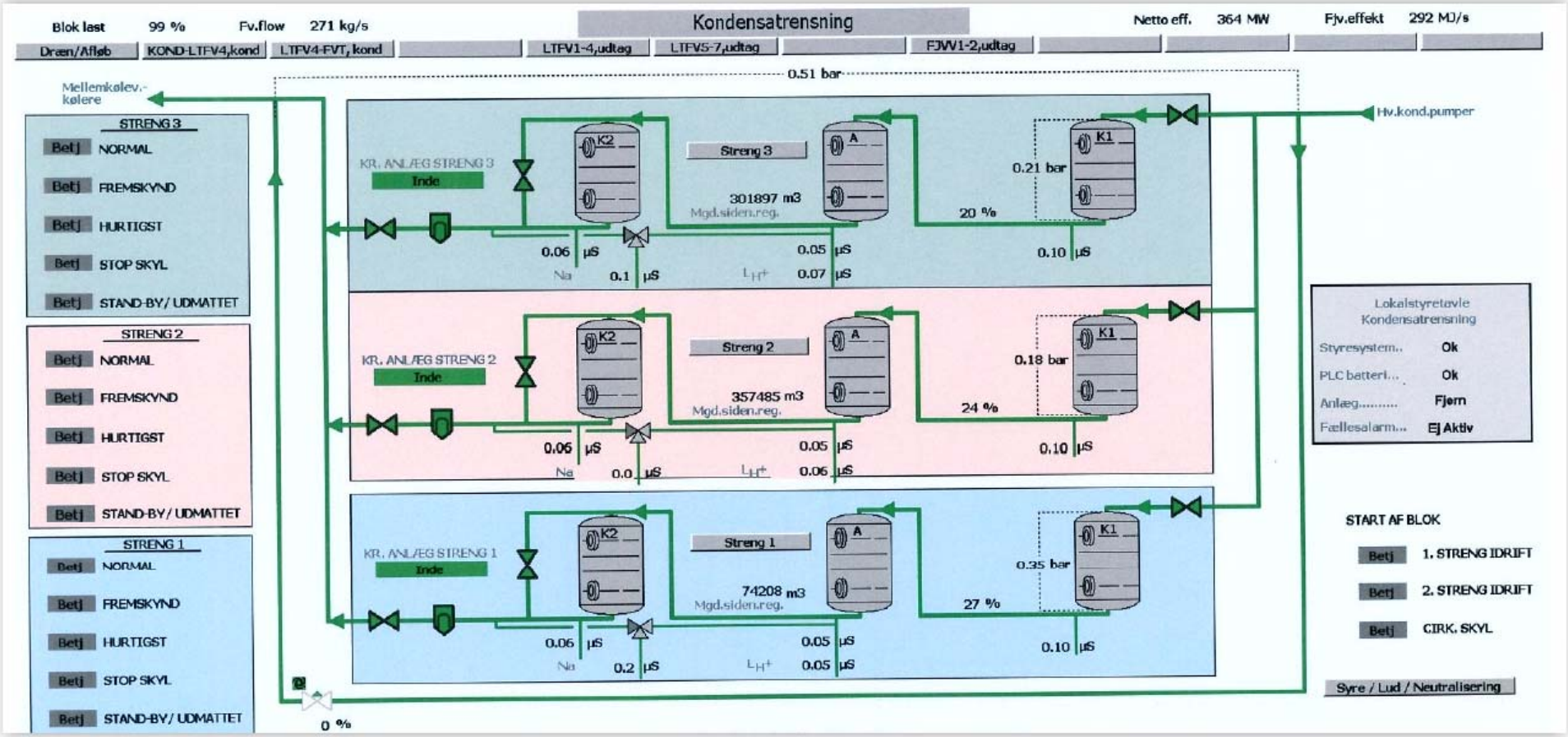
Blok last 99 %
Fv.flow 271 kg/s
Kondensatrensning
Netto eff. 364 MW
Fjv.effekt 292 MJ/s
Dræn/Afløb
KOND-LTFV4,kond
LTFV4-FVT, kond
LTFV1-4,udtag
LTFV5-7,udtag
FJVV1-2,udtag
0.51 bar
Mellemkølev.-kølere
Hv.kond.pumper
STRENG 3
Betj NORMAL
Betj FREMSKYND
Betj HURTIGST
Betj STOP SKYL
Betj STAND-BY/ UDMATTET
STRENG 2
Betj NORMAL
Betj FREMSKYND
Betj HURTIGST
Betj STOP SKYL
Betj STAND-BY/ UDMATTET
STRENG 1
Betj NORMAL
Betj FREMSKYND
Betj HURTIGST
Betj STOP SKYL
Betj STAND-BY/ UDMATTET
KR. ANLÆG STRENG 3
Inde
Streng 3
301897 m3
Mgd.siden.reg.
0.21 bar
20 %
0.06 µS
0.1 µS
0.05 µS
0.07 µS
0.10 µS
KR. ANLÆG STRENG 2
Inde
Streng 2
357485 m3
Mgd.siden.reg.
0.18 bar
24 %
0.06 µS
0.0 µS
0.05 µS
0.06 µS
0.10 µS
KR. ANLÆG STRENG 1
Inde
Streng 1
74208 m3
Mgd.siden.reg.
0.35 bar
27 %
0.06 µS
0.2 µS
0.05 µS
0.05 µS
0.10 µS
Lokalstyretavle
Kondensatrensning
Styresystem.. Ok
PLC batteri... Ok
Anlæg..... Fjern
Fællesalarm... Ej Aktiv
START AF BLOK
Betj 1. STRENG IDRIFT
Betj 2. STRENG IDRIFT
Betj CIRK. SKYL
Syre / Lud / Neutralisering
0 %

Condensate polishing

- Removal of iron oxides by depth filtration in K1-filter
  - Rinse of K1-filter prior to regeneration by Air-Bump-Rinse-Operation (ABRO)
  - Cyclic rinse operation for separation of iron oxides from resin
- Removal of ionic contamination by ion exchange
  - Cooling water – brackish water from Limfjorden
  - Regeneration when ammonia breaks through K1-filter
  - Test of kinetic in ion uptake by simulated salt inleakage

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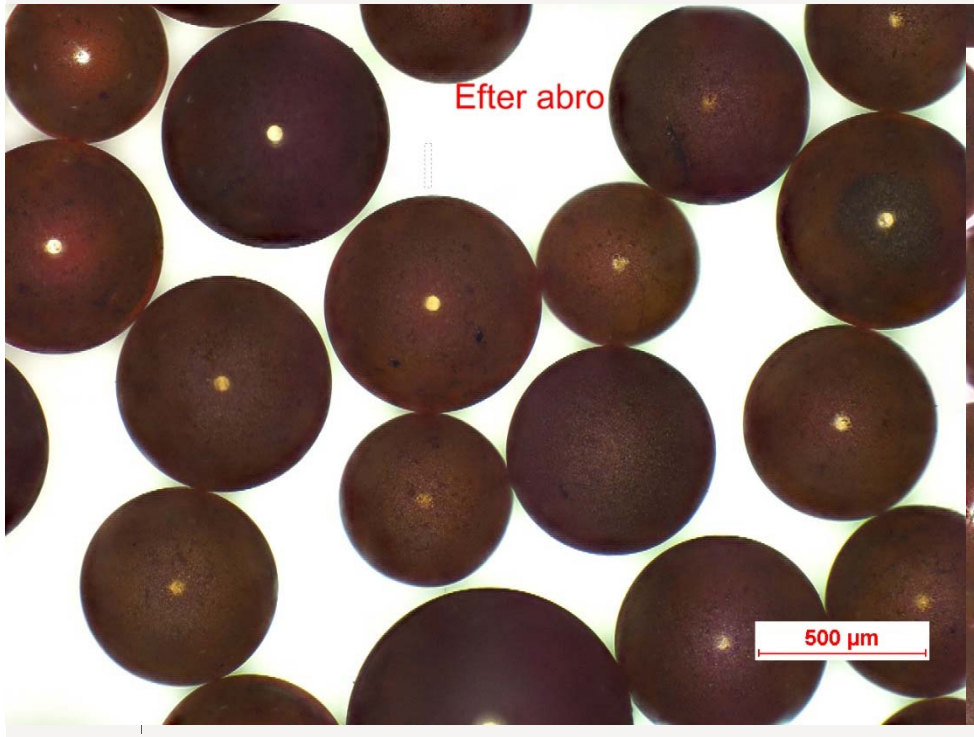
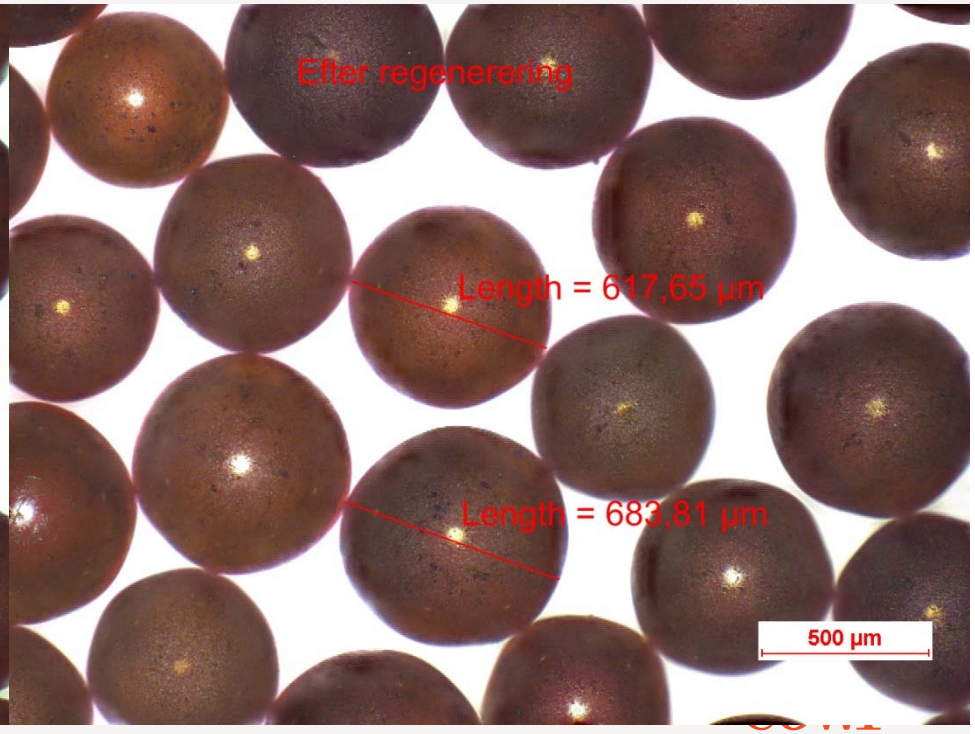
KR3 – ABRO with dirty nozzle in backflush filter

ABRO KR1 – ABRO with dirty nozzle in backflush filter





Simulated salt inleakage

- Dosing a mixture of NaCl and Na_2SO_4 ahead of K1-filter – mix of the salts correspond to sea water
- First dose ~ 100 µS/cm after K1 – check conductivity after K2:
- If it stabilises < 0,1 µS/cm – increase dosing to 200 µS/cm
- if it goes above 0,1 µS/cm – decrease dosing to 50 µS/cm
- Get two stable readings of conductivity after CP at different loads

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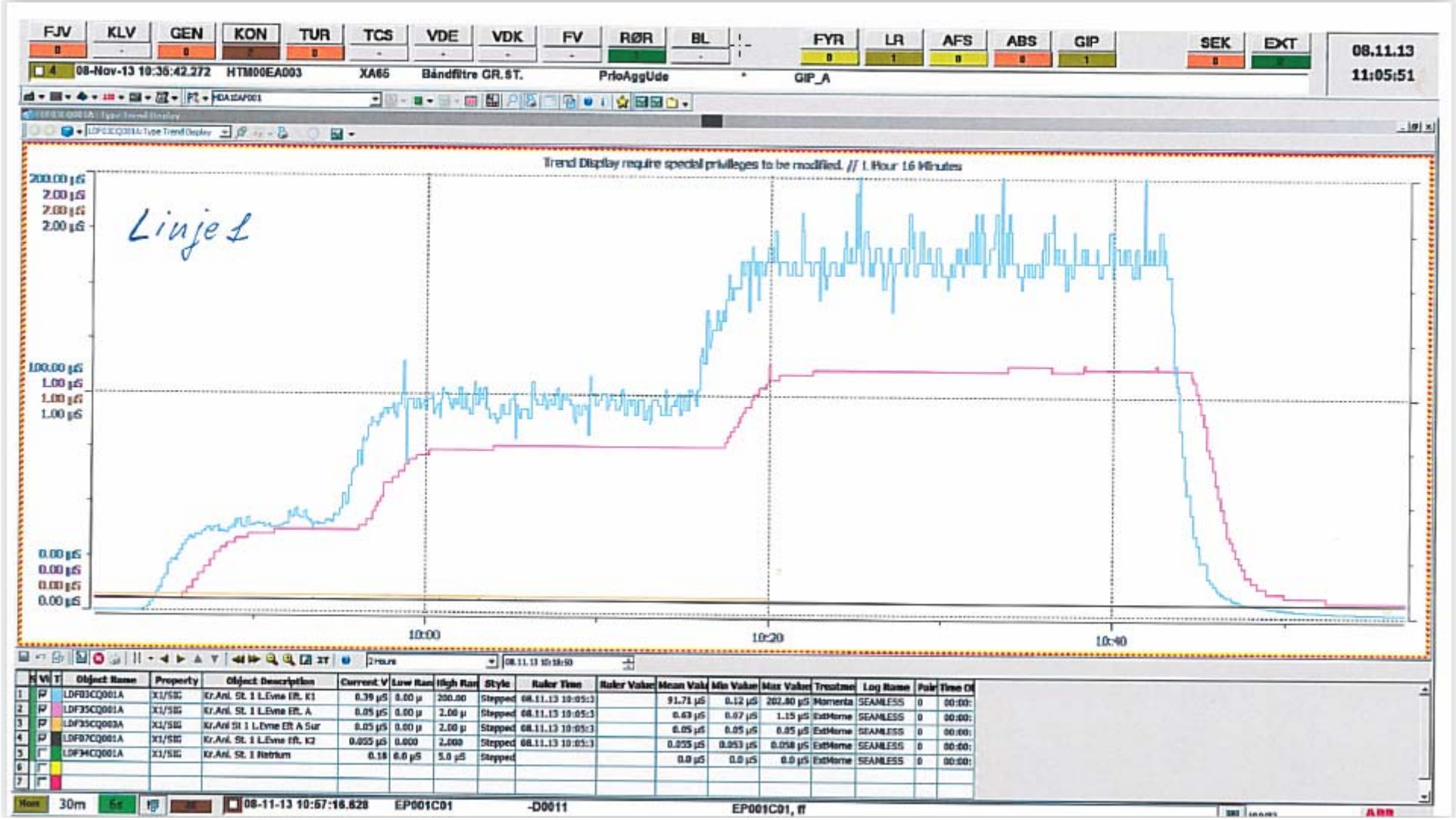
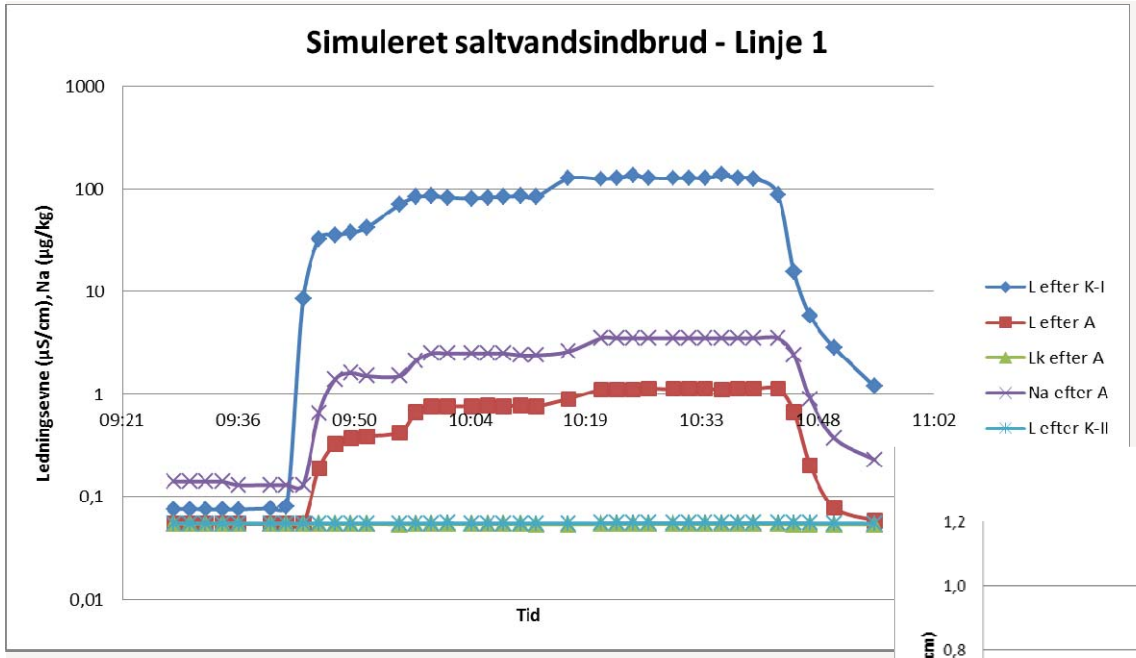
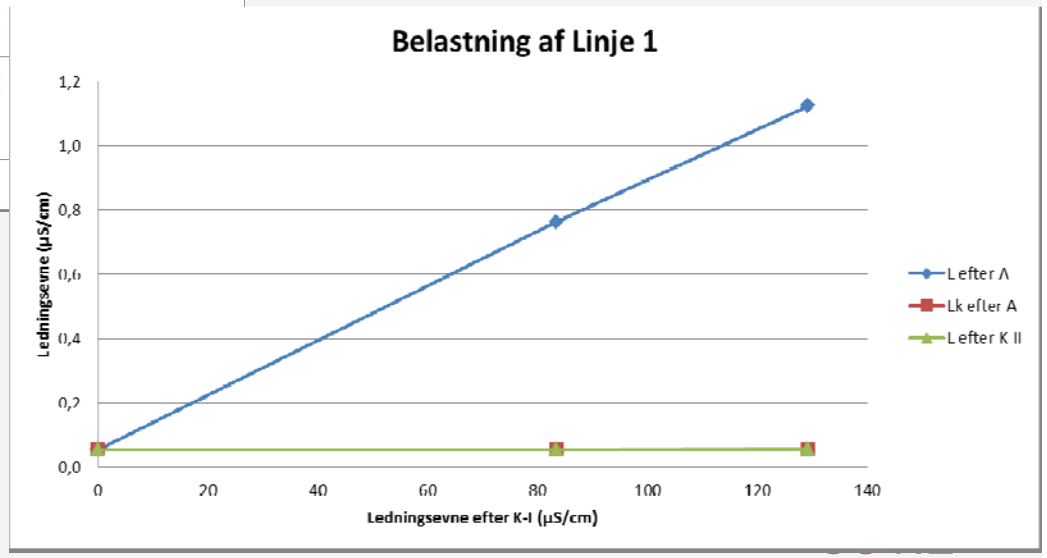

FJV
KLV
GEN
KON
TUR
TCS
VDE
VDK
FV
RØR
BL
FYR
LR
AFS
ABS
GIP
SEK
EXT
08.11.13
11:05:51
08-Nov-13 10:36:42.272
HTM00EA003
XA65
Båndfiltre GR.ST.
PrioAggUde
GIP_A
Trend Display require special privileges to be modified. // 1 Hour 16 Minutes
Linje 1
200.00 µS
2.00 µS
100.00 µS
1.00 µS
0.00 µS
10:00
10:20
10:40
08-11-13 10:07:16.828
EP001C01
-D0011
EP001C01, ff


Simuleret saltvandsindbrud - Linje 1
1000
100
10
1
0,1
0,01
Ledningsevne (µS/cm), Na (µg/kg)
09:21
09:36
09:50
10:04
10:19
10:33
10:48
11:02
Tid
L efter K-I
L efter A
Lk efter A
Na efter A
L efter K-II


Belastning af Linje 1
1,2
1,0
0,8
0,6
0,4
0,2
0,0
Ledningsevne (µS/cm)
0
20
40
60
80
100
120
140
Ledningsevne efter K-I (µS/cm)
L efter A
Lk efter A
L efter K II