

TVO

MEASURING IODINE FROM STACK FILTERS

20.9.2017



Hovi Petri

TEOLLISUUDEN VOIMA OYJ

- Finnish energy company with nuclear power plants in Olkiluoto
- 2 * 880 MW BWR power plants in operation
- 1 * 1600 MW EPR under construction
 - After completion TVO produces one third of Finnish electricity



CHANGES IN MEASUREMENT SYSTEMS WERE MADE DURING WINTER 2015 AND 2016

- Old system
 - 2 parallel lines with noble gas pulse counter and aerosol/iodine filter for laboratory analysis
- Current system
 - One line with online noble gas monitor and aerosol/iodine filter for laboratory analysis (No modification to sampling point)
 - One line with online noble gas monitor, α/β particulate monitor and iodine monitor and aerosol/iodine filter for laboratory analysis (new sampling point)

OLD SYSTEM



NEW SYSTEM



AEROSOL RESULTS FROM PARALLEL LINES DIDN'T MATCH

Valm. prosessinäyte, Näytä PJHO TVO

Arkisto Kenttä Raportit Ohje

Näytepiste: 1.553C11 Poistokaasupiippu, aerosoli

Näytetyyppi: X-RK-PÄÄ-Aero Aerosolipäästöt

Näytepvm: 010616 05:09

Näytteno: 2016 4876 1 Asiakas: OL1 Kirjau

Kuvaus Näytteestä/Näytteenc Näytteenottaj HKLF Kirjaa

Hyv ID: AHA Dokumentti

Hyl. Pvm 020616 klo 07:22

Analyysi	Anal.tulos	Yksikkö	Mitt.tulos	Mitt.yks	Mitt.epäv.
Keräysaika	154.3E3	s			
F-näyte	85	m ³	33	l/min	
F-piippu	17.35E6	m ³	112.44	m ³ /s	
Gamma	895E3	Bq		Bq/n	
MN-54	261E3	Bq	1.2772	Bq/n	12.9
CO-58	156E3	Bq	0.75969	Bq/n	21.3
CO-60	478E3	Bq	2.33939999	Bq/n	8.5999999

Valm. prosessinäyte, Näytä PJHO TVO

Arkisto Kenttä Raportit Ohje

Näytepiste: 1.553C21 Poistokaasupiippu, aerosol

Näytetyyppi: X-RK-PÄÄ-Aero Aerosolipäästöt

Näytepvm: 010616 04:58

Näytteno: 2016 4878 1 Asiakas: OL1 Kirjau

Kuvaus Näytteestä/Näytteenc Näytteenottaj HKLF Kirjaa

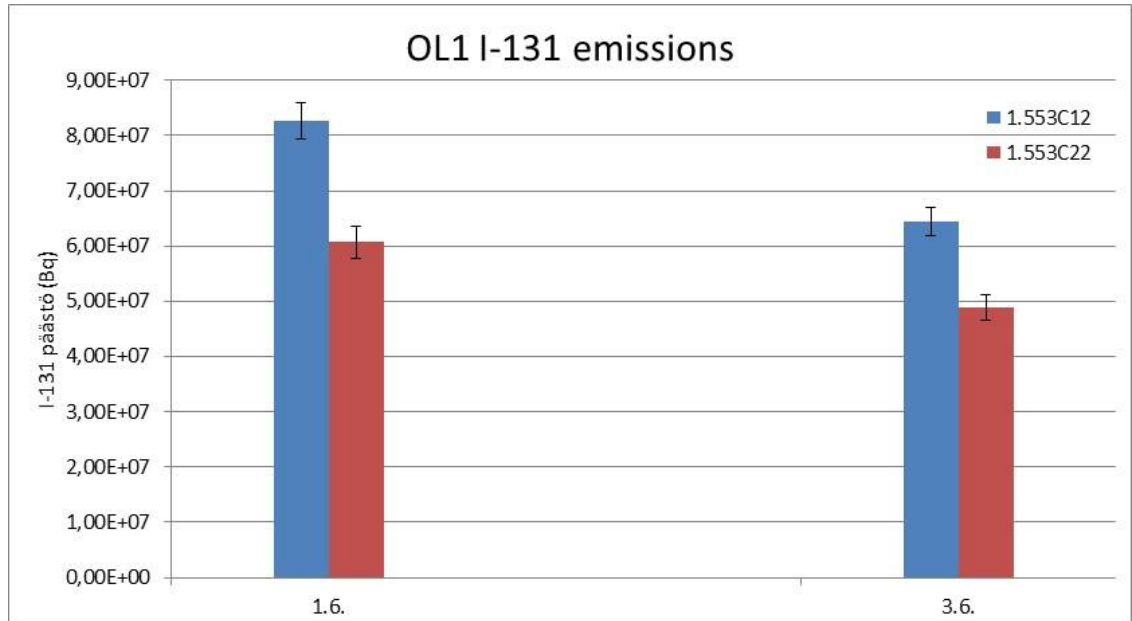
Hyv ID: AHA Dokumentti

Hyl. Pvm 090117 klo 08:10

Analyysi	Anal.tulos	Yksikkö	Mitt.tulos	Mitt.yks	Mitt.epäv.
Keräysaika	154.0E3	s			
F-näyte	42	m ³	16.5	l/min	
F-piippu	17.32E6	m ³	112.45	m ³ /s	
Gamma	0.0000	Bq		Bq/n	

IODINE RESULTS WEREN'T PERFECT EITHER

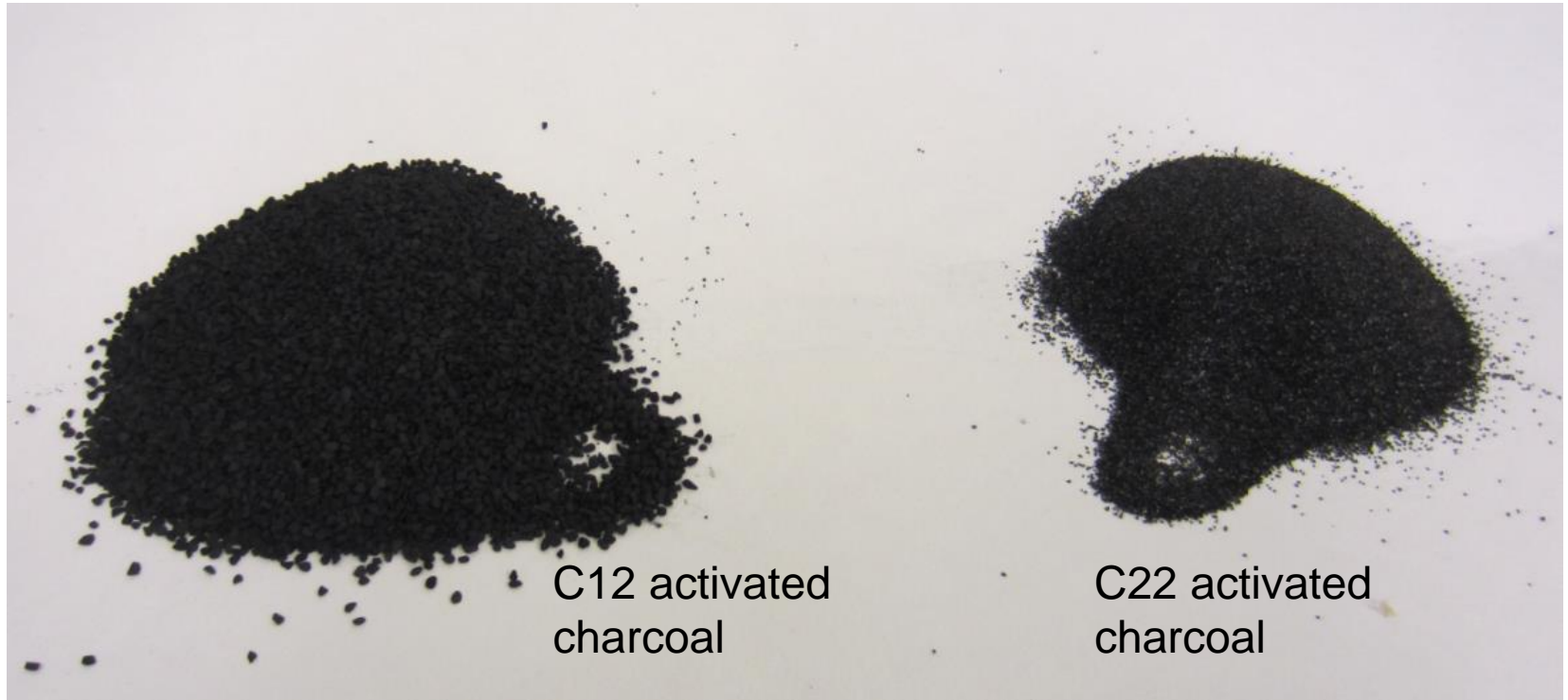
- We were able to get aerosol collection to work better, but it still isn't good. It will require sampling line modification
- Iodine collection efficiency didn't remarkably get better after opening control valve and closing delay line
- Maybe something is wrong with calibrations



FILTERS FROM PARALLEL LINES



GRAIN SIZE IS DIFFERENT

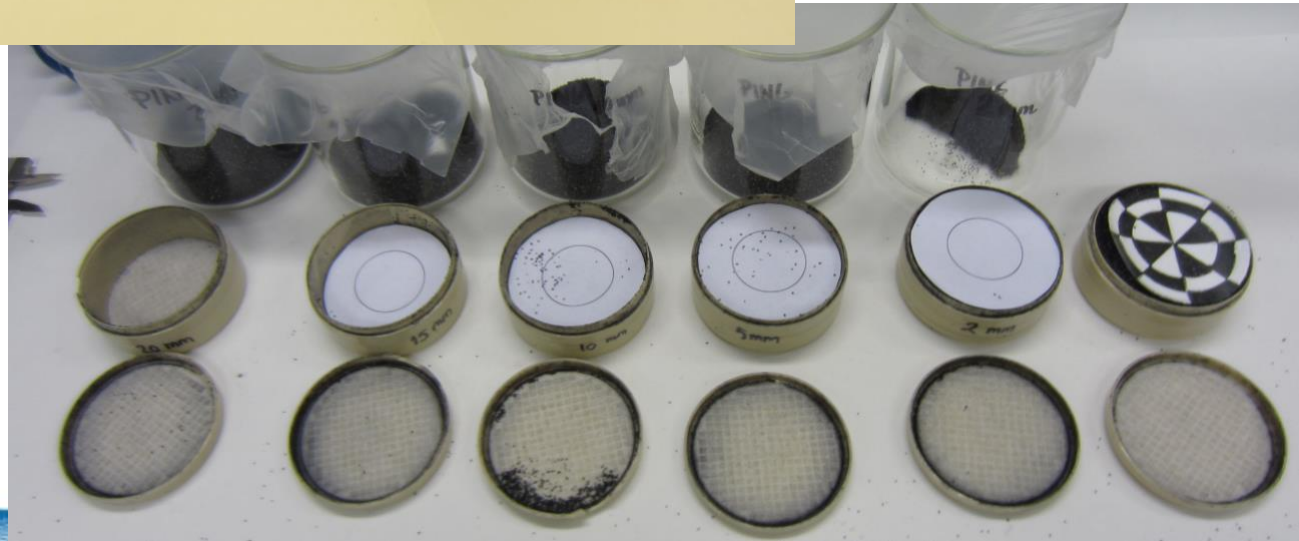


TIME FOR SOME NEW CALIBRATION SOURCES



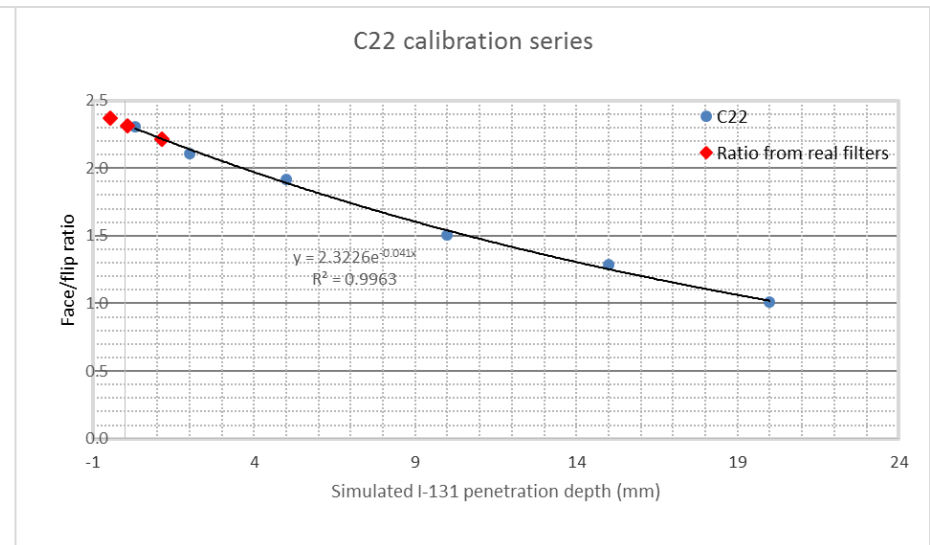
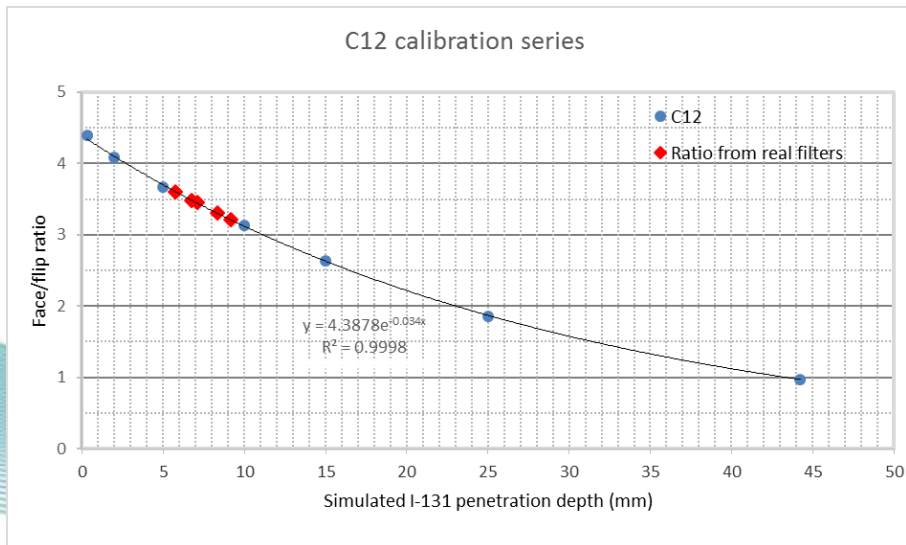
C12 calibration sources were made for 0, 2, 5, 10, 15, 25 and 44 mm penetration depth

C22 calibration sources were made for 0, 2, 5, 10, 15 and 20 mm penetration depth



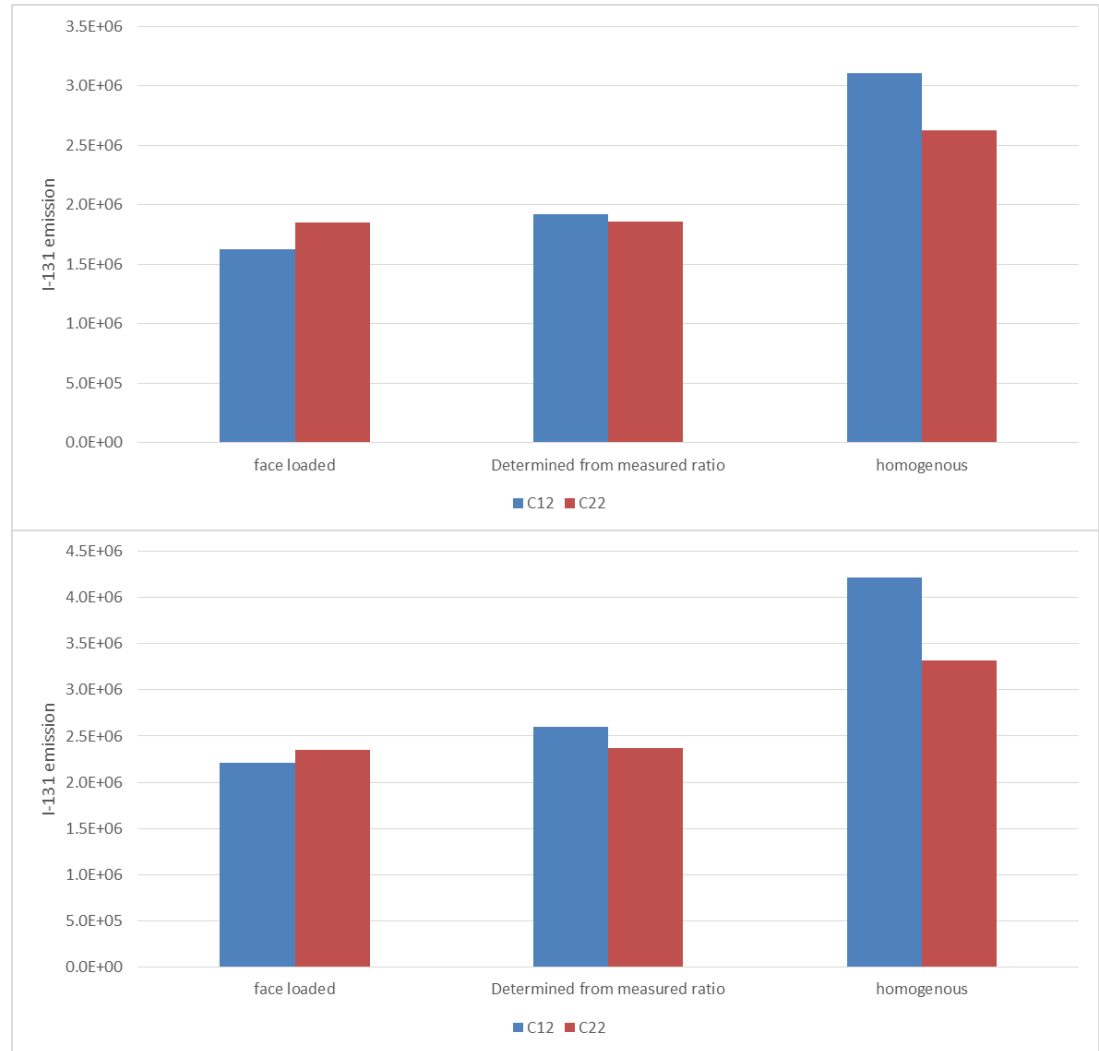
RESULTS OF CALIBRATION MEASUREMENTS

- Filters were spiked with E&Z mixed nuclide gamma standard solution
- Filters were measured face side down and then flipped over and measured again three times.
- Sn-113 392 keV peak was used to determine face/flip ratio. It was chosen because it's energy line is relatively close to I-131.
- This was done for two different detectors. Both detectors have calibration for every penetration depth. Ratio is determined when there is significant activity in the filter and calibration is chosen accordingly.



THE DIFFERENCE BETWEEN CALIBRATIONS

For C12 filter 10 mm calibration was used and for C22 filter 2 mm calibration was used



WHAT'S STILL LEFT TO BE DONE

- Sampling line need to be modified for better aerosol collection
- We're looking into changing C12 filter holders to similar with C22 filter so both sampling lines would have same filters
- Preparing and measuring takes long time, could this be done with LabSOCS. We will be changing to Canberra later this year.

REFERENCES

Activated charcoal measurement is applied from D.M. Montgomery's paper, "Calibrating Germanium Detectors for Assaying Radio-iodine in Charcoal Cartridges", Radioact. Radiochem, 1(2),4, (1990)

"Zero" penetration depth filter is made according to ANSI N42.14-1999. It's supposed to be pseudo-uniformly deposited source with no significant migration of the activity.

The logo for Teollisuuden Voima Oyj (TVO) is displayed in white, bold, sans-serif capital letters within a dark blue circular shape. The background of the slide features overlapping circles in shades of blue and teal, and a decorative graphic of many thin, curved lines in light grey on the right side.

TVO

KIITOS