

# METHOD FOR DIGESTION AND ANALYSIS OF CHEMICAL PRODUCTS

180306

Charlotte Andersson and Susan Grassl  
Ringhals AB

# RINGHALS – THE LARGEST NUCLEAR POWER PLANT IN SWEDEN



- West coast, Sweden
- Produces 20% of the total demand for electricity in Sweden
- 1500 employees

# RINGHALS NUCLEAR POWER PLANT

- Importance of clean chemical products in the plant.
- Avoid corrosion, neutron activation and emission to the environment.
- All chemical products must be analyzed and categorized before use.
- Chemical Products: All types of products that may release substances that affect the properties of other materials i.e. oil, paint, tape, grease, markers, gaskets, sealings...



# RINGHALS NUCLEAR POWER PLANT

- About 3000 products, Ringhals and Forsmark
- Reanalyse every 5 years
- About 150 analyses/year

# ANALYSIS

## ■ Anions

- $F^-$ ,  $Cl^-$ ,  $Br^-$ ,  $SO_4^{2-}$

## ■ Metals

- Ag, Cd, Co, Cu, Pb, Sb, Zn

## Technical labelling

for chemical products



The product may get into contact with all types of process systems and process media. May thus be used on the inside of the systems. Residues do not need to be removed.



The product may get into contact with all types of process systems and process media. May thus be used on the inside of the systems. Residues must be removed from the inside of the systems. On the outside of the systems residues do not need to be removed.



The product may get into contact with the outside of process systems. Residues must however be removed.



The product may not get into contact with the inside nor the outside of the process system.



The product may not be used in controlled areas or on the PWR-turbine side.



Contains operational-, laboratory- and firefighting chemicals, gases and products used for surface protection (TBY).

Entry of chemical products is only allowed after approval and registration.

# IKA AOD 01



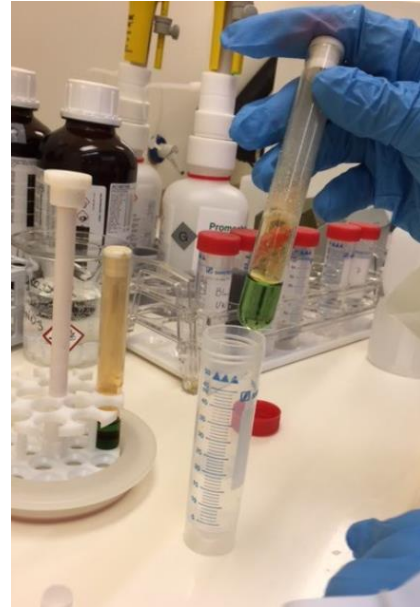
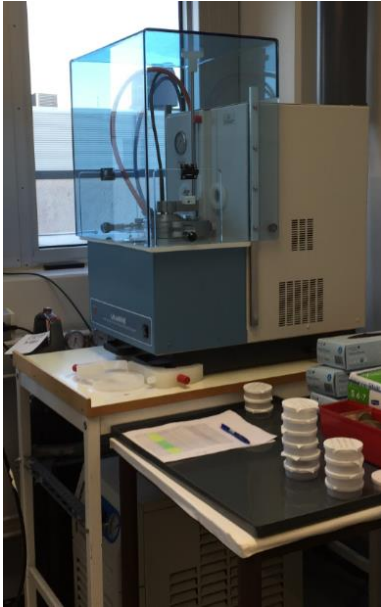
# UW

- Milestone UltraWAVE
- Approx. 0,4 g sample
- 4 ml HNO<sub>3</sub>
- 130 bar and 240°C
- Samples are diluted with MQ to 40 ml
- Filtration (0,45 µm)

## Microwave program

Step	Time	T1	T2	P	Power
1	00:13:00	120°C	60°C	100	1500W
2	00:12:00	240°C	60°C	130	1500W
3	00:10:00	240°C	60°C	130	1500W

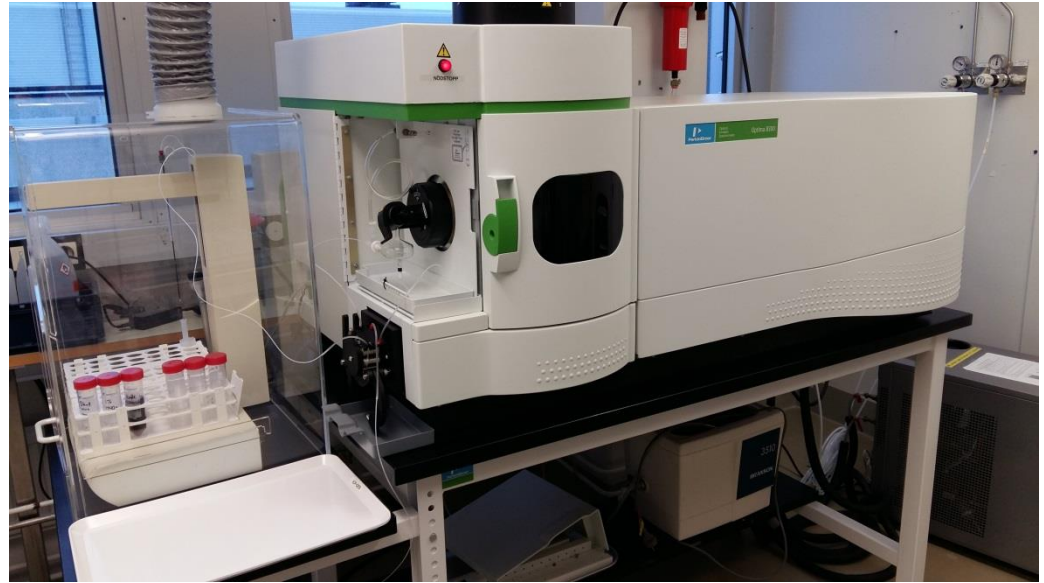
UW





# ICP-OES

- Perkin Elmer Optima 8300 ICP-OES
- Perkin Elmer S10 autosampler
- Meinhardt nebulizer
- Cyclonic spray chamber
- Alumina injector tube
- Quartz torch



# ICP-OES

## Calibration

- Blank
- STD 0,1 ppm
- STD 2 ppm

## Quality Control

- 0,15 ppm
- 1 ppm

# EVALUATION

- Ag < 5 ppm
- Cd < 5 ppm
- Co < 5ppm
- Cu < 5 ppm
- Pb < 5 ppm
- Sb < 5 ppm
- Zn < 10 ppm

		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R						
<b>LÅT STÅ!</b>					<b>Ag Cd Co Cu Pb Sb Zn</b>							<b>LÅT STÅ!</b>													
					DL (ppm)														5	5	5	5	5	5	10
					Visat värde (ppm)														<5	<5	<5	<5	<5	<5	<10
					Nolla <sub>medel</sub> (ppm)														0,0000	0,0000	0,0000	0,0314	0,0002	0,0022	0,0231
		<i>Halt ICP-OES (ppm)</i>										<i>Uträknad halt (ppm)</i>													
Prov	Upplösningsdatum	Vikt (g)	Analysdatum	Ag	Cd	Co	Cu	Pb	Sb	Zn	Ag	Cd	Co	Cu	Pb	Sb	Zn								
4. Loctite 8013	180124	0,208	180125	0,0015	0,0007	0,0004	-0,0038	-0,0292	-0,0047	0,1075	<5	<5	<5	<5	<5	<5	<5	16,2							
5. Grafoil GTS	180124	0,383	180125	0,0002	-0,0001	-0,0003	0,0033	-0,0040	-0,0002	0,0148	<5	<5	<5	<5	<5	<5	<5	<10							
6. Firestopp	180124	0,212	180125	0,0018	-0,0004	0,0020	-0,0071	-0,0311	-0,0033	0,0223	<5	<5	<5	<5	<5	<5	<5	<10							
7. Greaseway electric	180124	0,282	180125	-0,0002	0,0003	-0,0001	-0,0044	-0,0064	-0,0037	0,2059	<5	<5	<5	<5	<5	<5	<5	25,9							

# SUMMARY

- Analysis of chemical products at Ringhals
  - 3000 products
  - 150 analysis/year
- Anions
- Metalls
  - UW-Micro digestion
  - ICP-OES analysis