METHOD FOR DIGESTION AND ANALYSIS OF CHEMICAL PRODUCTS

180306

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RINGHALS – THE LARGEST NUCLEAR POWER PLANT IN SWEDEN

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

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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…

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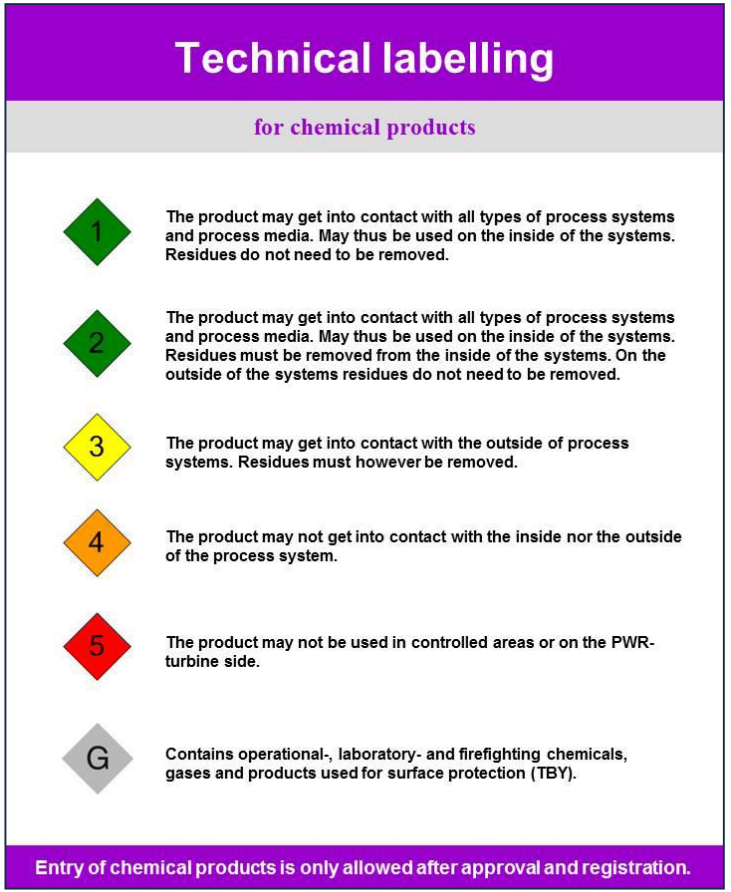
RINGHALS NUCLEAR POWER PLANT

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

ANALYSIS

- Anions
  - F^-, Cl^-, Br^-, SO_4^{2-}
- Metalls
  - Ag, Cd, Co, Cu, Pb, Sb, Zn



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- Milestone UltraWAVE
- Approx. 0,4 g sample
- 4 ml HNO_3
- 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

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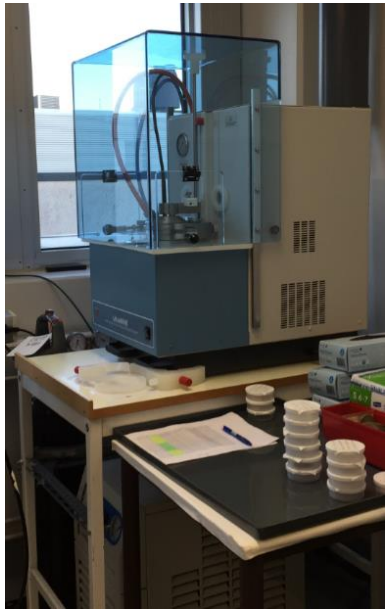
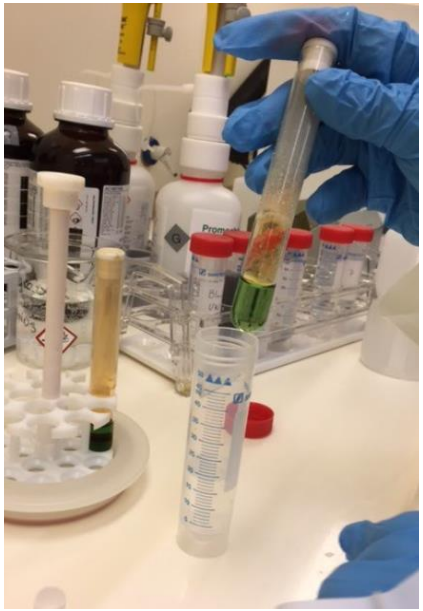
UW





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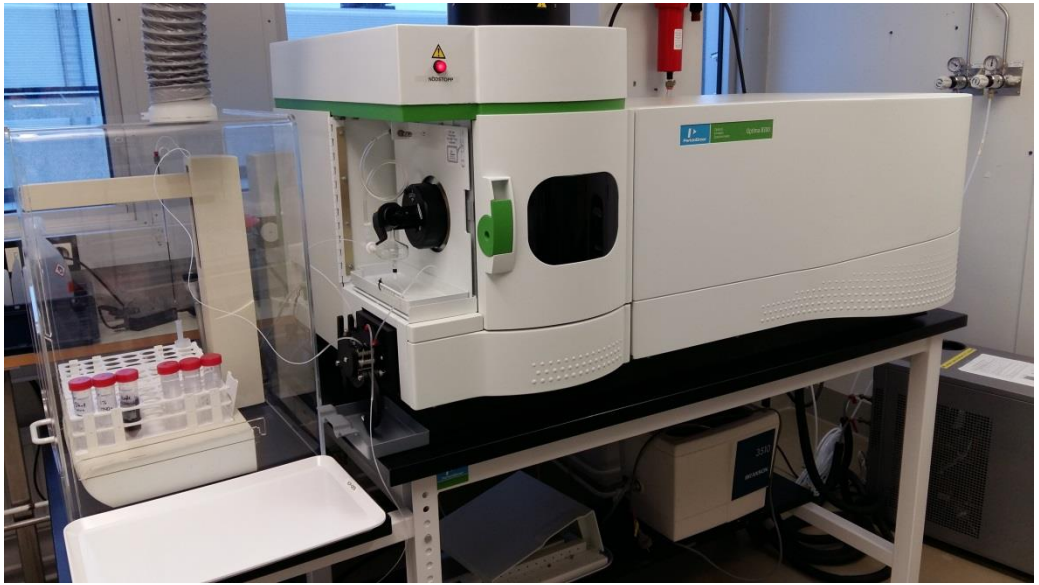
ICP-OES

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



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ICP-OES

Calibration

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

Quality Control

- 0,15 ppm
- 1 ppm

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EVALUATION

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

LÅT STÅ!

	Ag	Cd	Co	Cu	Pb	Sb	Zn
DL (ppm)	5	5	5	5	5	5	10
Visat värde (ppm)	<5	<5	<5	<5	<5	<5	<10
$Nolla_{medel}$ (ppm)	0,0000	0,0000	0,0000	0,0314	0,0002	0,0022	0,0231

LÅT STÅ!

				Halt ICP-OES (ppm)							*Uträknad halt (ppm)*						
Prov	Upplösnings-datum	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	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	<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	<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	25,9

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SUMMARY

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