WOW TECHNOLOGY's Innovative treatment for HLW and ILW Liquid Radwastes - 17654

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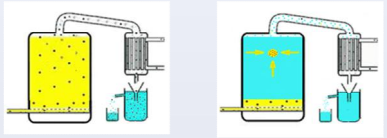
Outperforming treatment designed for decontamination of HLW and ILW Liquid Radwastes

Fluid Dynamics Technology & D.F.

WOW proprietary technology performs a **localized separation** between solvent and solute and/or suspended elements.

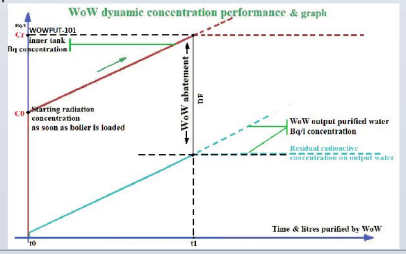


Standard process vs WOW process

The selective evaporation improves the **Decontamination Factor** by a factor of **thousands times** vs any standard evaporator. This makes it suitable for the **decontamination of ILW and HLW liquid radwastes**.

Continuous Process

Thanks to the **full control of the drag/entrainment effect**, no batches are required to reach the desired Decontamination Factor.



No Secondary Waste

No filters, membranes, resins or additives are used to carry on the process. Moreover, **the equipment self decontaminates** after use.

Automated and Transportable

Fault Tolerant & Failure Proof - Automated and **remotely controlled**, the equipment is **modular** for **transportability** and **tailored** to the application.

Reached validations and results of on-field applications

1 Test with first device, at Applied Nuclear Energy Laboratory (LENA) of the University of Pavia - IT

Continuous Operation:	20 litres/day for 39 days
Contaminants Concentration:	1,500 mg/l of ^{133}Cs totally soluted + 2 radioactive tracers: ^{134}Cs (4.2MBq) *few µg*, ^{137}Cs (3.6MBq) *few µg*
Conc. Level Simulation:	4.8 TBq/l typical of HLW *6,000 times higher than Fukushima-Daiichi cooling water*

Certified Results

Min. Decontamination Factor (DF)	DF > 7,500
Removal Efficiency	99.986%

2 Real case application of the improved device, on LLW: treatment of 1,000lt. of decontamination solution produced by the Radiochemistry Laboratory of the University of Pavia - IT.

Certified Results

RADIOISOTOPES	MEASURED DECONT. FACTORS (DF)
^{137}Cs	40,338
^{134}Cs	39,744
^{241}Am	33,425
^{109}Cd	18,735
^{60}Co	7,581

Final residual concentrated waste solution < 1 Lt

3 **Full scale industrial application: Nuclear repository of Saluggia - IT**

Certified: by British National Physics Lab. – NPL by site operator and University of Pavia - LENA

Continuous Operation:	Average ≈410litres/day for 120 days → total ≈50,000 Lt
Initial liquid characteristics	pH = 4.6; Fluorides <1mg/l; Chlorides ≈15mg/l; Nitrates <5mg/l; Sulfates ≈303mg/l; Phosphates Absent; Sodium ≈22mg/l; Potassium ≈11mg/l; Magnesium ≈6mg/l; Calcium ≈94mg/l.
Radioisotopes	LLW of ^{137}Cs ; ^{60}Co ; ^{241}Am ; ^{90}Sr

Certified Results

Radio-nuclides	Measures by	Decontamination Factor (DF)			
		After 30 Days	After 60 Days	After 90 Days	After 120 Days
^{137}Cs	UNIPV-LENA and by N.P.L.	80,000	142,000 ÷ 168,000	107,000 ÷ 412,000	335,000 ÷ 343,000
^{60}Co	UNIPV-LENA and by N.P.L.	56,000	161,000 ÷ 178,000	520,000 ÷ 685,000	>264,000÷890,000
^{241}Am	UNIPV-LENA and by N.P.L.	>23,000	>5,290 ÷ 238,400	>300,000	>> (< MDA)
^{90}Sr	UNIPV-LENA and by N.P.L.	>2,044	>26,200	>66,760 + 96,000	>91,470; (< MDA)

(*) output activity much lower than MDA | (**) Uncertainty 3% | (***) Measures conducted on several samples: output activity is extremely low and concentrated solution of the boiler has some sediments | (^) NPL didn't issue here any test report (ND) | (^^) Test at NPL labs is still on going.

Ongoing Deployments

USA - DOE's EM INTL. PROGRAM – Treatment of HLW & ILW Liquid Radwaste for DOE Hanford & SRNL Sites

TREATMENT VALIDATION:

WOW's tailored equipment for this specific application

Very High Decontamination Factor (DF) required

HLW SRS Effluent	HLW Hanford Technetium Eluate
Contaminants: Salts, U, Cs, Sr, Pu, Ru	Contaminants: Salts, Cs, Tc

TUV SUD NEL in UK – NORTH SEA

Produced Water decontamination

Despite the **strong presence of volatile elements**, **WOW** performed very well

WOW's tailored equipment for this specific application

Produced Water from oil & gas production contaminated by Crude Oil, Volatile elements and Chemicals

DF > 185 (for oil element)

Upcoming deployments: Nuclear repositories