

SFR dismantling: treatment of sodium and sodium derivatives



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Phenix reactor.

CHALLENGE: REMOVE SODIUM RISK PRIOR TO THE DISMANTLING PHASES

- Very significant sodium amount (5,500 tons at Superphenix, 1,500 tons at Phenix)
- Non-drainable retentions
- All surfaces are wetted
- Specific components (cold traps, ...).

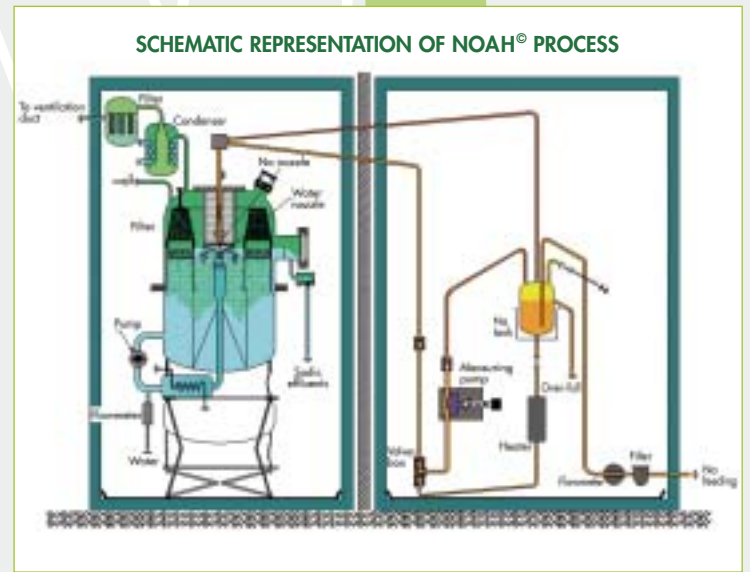
NOAH® PROCESS (CEA PATENT)

• **PRINCIPLE:** drain reactor and circuits and convert contaminated sodium into aqueous sodium hydroxide by injection of a pressurized sodium spray counter-current to sodium hydroxide flow.

• REACTIONS:



• Industrial process used for sodium treatment of many reactors: Rapsodie (37 t), Superphenix (5,500 t), Phenix (1,500 t – previously), Dounreay's Prototype Fast Reactor (1,100 t).



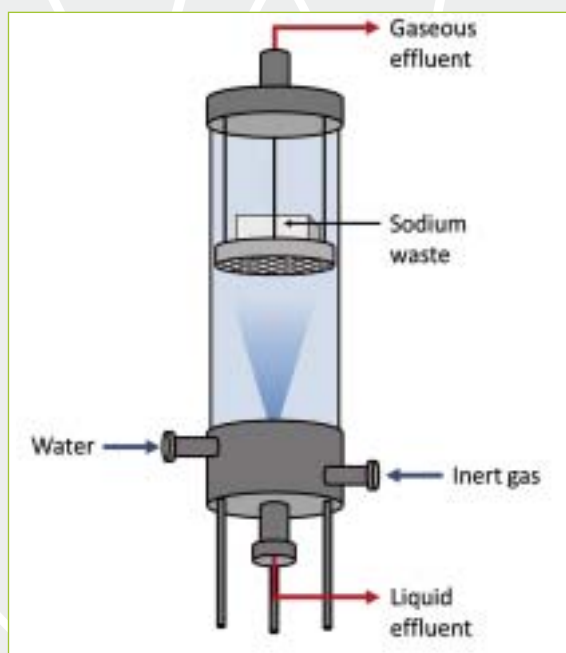
HYDROLYSIS PROCESS

• **PRINCIPLE:** treat specific components (cold traps, valves, tanks...). Water sprayed on sodium wastes packed in a basket under inert gas.

• REACTIONS:



• Application of this process for Phenix and Rapsodie cold trap treatment in future ELA facility.



PEELA prototype for ELA process qualification.



MININANET:
CEA facility
for sodium
hydrolysis
studies.

CARBONATION (SEVERAL CEA PATENTS FOR SPECIFIC APPLICATIONS)

• **PRINCIPLE:** treat retentions and films. Sodium carbonation by continuous injection of a gas mixture composed of water vapor, carbon dioxide and nitrogen. Sodium carbonates are chemically inert.

• REACTIONS:



• Application of this process for residual sodium treatment of reactor vessel and secondary loops (Rapsodie, Phenix and Superphenix).



Carbonation of sodium retention (mock-up of Rapsodie).



SCORPION/ENCRINE:
CEA facility for sodium
carbonation studies.

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