

Heavy metal summer school June 12 - 16, 2023 | SCK CEN, Mol, Belgium

CFD SIMULATIONS IN SUPPORT TO ADVANCED HLM SYSTEMS





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Project	ltem
Myrthe, SEARCH	MYRRHA primary coolant circulation
MAXSIMA	Control Rod insertion in COMPLOT
SESAME	ALFRED primary coolant circulation HLM solidification and remelting
PASCAL	Sloshing phenomena investigation
PATRICIA	CIRCE THETIS primary coolant circulation
ANSELMUS	Safety Rod insertion in COMPLOT Deformed bundle thermal hydraulics

GEN-IV HLM international framework



MYRRHA PRIMARY COOLANT CIRCULATION

- CFD modeling of HLM flows in pool configuration with implementation of bypass flows to avoid stagnation regions.
 Simulation of transient incidental scenarios with extreme parameters.
- CFD simulation and modeling of fuel products dispersion in the MYRRHA primary coolant loop.

CONTROL/SAFETY ROD DYNAMICS

Experimental and numerical activities on control/safety rod insertion •Test and qualify the buoyancy/gravity driven control/safety rods in MYRRHA

•Numerical CFD simulation of the CR/SR dynamics in the COMPLOT experimental facility. Validation of the CFD methodology and results against the experimental results

POOL THERMAL HYDRAULICS

Within EURATOM projects, the validation base for HLM system thermal hydraulics has been enlarged considerably with new experimental data ranging from a small scale, to intermediate scale and large scale experiments.





Sloshing CFD modeling (CRS4) and validation SHAKESPEARE experimental campaign (VKI)





92% of natural frequency

y Caos at 92.75% of natural frequency

Experimental (CVR) and numerical (CRS4) activities

investigating HLM freezing in SESAME-Stand facility

CFD numerical models developed in parallel for pool facilities have been validated using the experimental data.

The CFD became a qualified tool for design support and simulation of normal/incidental operation.

CRS4participationinEURATOM projects•2 people•CollaborationwithmanyEuropean institutes

- •1 M€ from the EC
- 1 master thesis
- Contribution to text books and lectures series
- 20 journal publications and peer review conference papers
- ~ 10 official deliverables







Courtesy of T. Melichar

