Design of a PID Controller for a Molten Salt Microreactor

Master's Plan

Sam J. Root,[1]
Major Professor: Michael McKellar,[1]
Committee Members: Robert A. Borrelli[1], Dakota Roberson[2]

University of Idaho · Idaho Falls Center for Higher Education
[1]Department of Nuclear Engineering and Industrial Management
[2]Department of Electrical and Computer Engineering

2022.10.13

Outline

Scope

Molten Salt Nuclear Battery (MSNB)

Molten Salt Microreactor...Goals... Blah... tikz figure would be good

Background on MSNB

Neutronics

[1]

Thermal Hydraulics

[2]

Process Control

Me

[2] Carter, J. P., 2022. Multi-physics investigation of a natural circulation molten salt micro-reactor that utilizes an experimental in-pile device to improve core physics and system thermal-hydraulic performance.
Ph.D. thesis, Univesity of Idaho

[1] Peterson, J., 8 2019. An analysis of the nuclear characteristics of a molten salt microreactor.
Master's thesis, University of Idaho

MSNB design

Figures from plotter (neutronics paper?), with a focus on control actuation

Applied Literature Review

Passive Feedback

Main Operational Control Problem - Transport Delay

Time-Variance and Non-Linearity

Future Work

Control Drum Characterization

MCNP

Process Simulation

Python

Controller Tuning

MATLAB-Simulink

Implementation and Testing

Python

Timeline

Table: Timeframe for Execution of Project

Tasks	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Control Drums	X	X	X				
Process Simulation		X	X	X			
Controller Tuning				X	X		
Implementation					X	X	
Cross-Cutting						X	X
Defend							X

Final Remarks

Other Considerations

Discussion

Acknowledgements

This work and my coursework is being completed under a Graduate Fellowship funded by Nuclear Regulatory Commission (NRC)

References

1. Peterson, J., 8 2019. An analysis of the nuclear characteristics of a molten salt microreactor. Master's thesis, University of Idaho.
2. Carter, J. P., 2022. Multi-physics investigation of a natural circulation molten salt micro-reactor that utilizes an experimental in-pile device to improve core physics and system thermal-hydraulic performance. Ph.D. thesis, Univesity of Idaho.