Proposal and Applicability Assessment of Control Logic for an sCO_2 Recompression Brayton Power Conversion System Considering Partial load Operation

Donghyeon Lee [a], Sungjoong Kim [a,b*]

[a] Department of Nuclear Engineering, Hanyang University,222 Wangsimni-ro, Seongdong-gu, Seoul, 04763, Republic of Korea

[b] Institute of nano science and technology, Hanyang University,222 Wangsimni-ro, Seongdong-gu, Seoul, 04763, Republic of Korea

** Corresponding author: sungjkim@hanyang.ac.kr*

Introduction & Objective

❖ ***Operational Flexibility under Partial Load Operation***

- Maintaining Stable and Efficient Performance

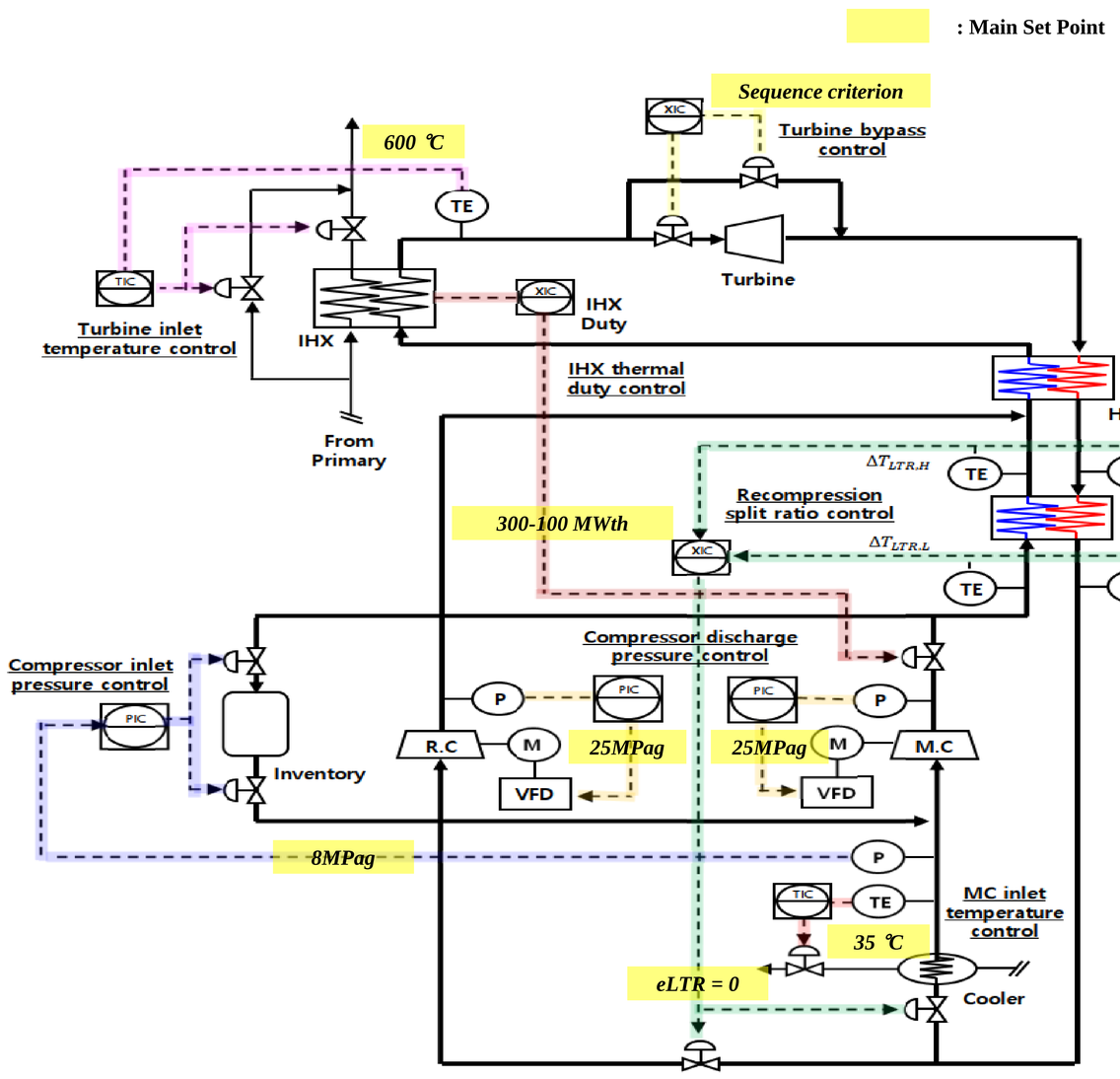
❖ ***Selection of sCO_2 Recompression Brayton Cycle***

- - Higher Efficiency and More Compact System Size

❖ ***Control Logic Proposal for Partial Load Operation***

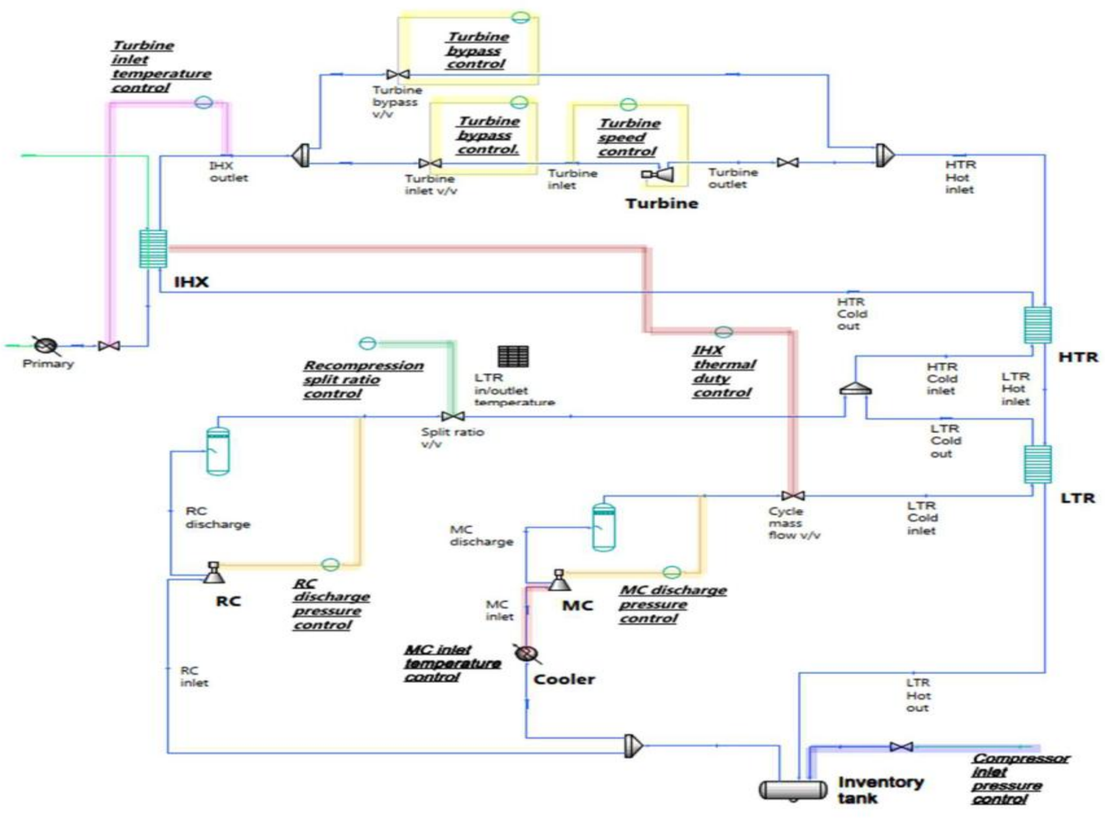
❖ ***Applicability Assessment under Start-up, Normal and Stop***

Control Logic Proposal



Overview of Applicability Assessment

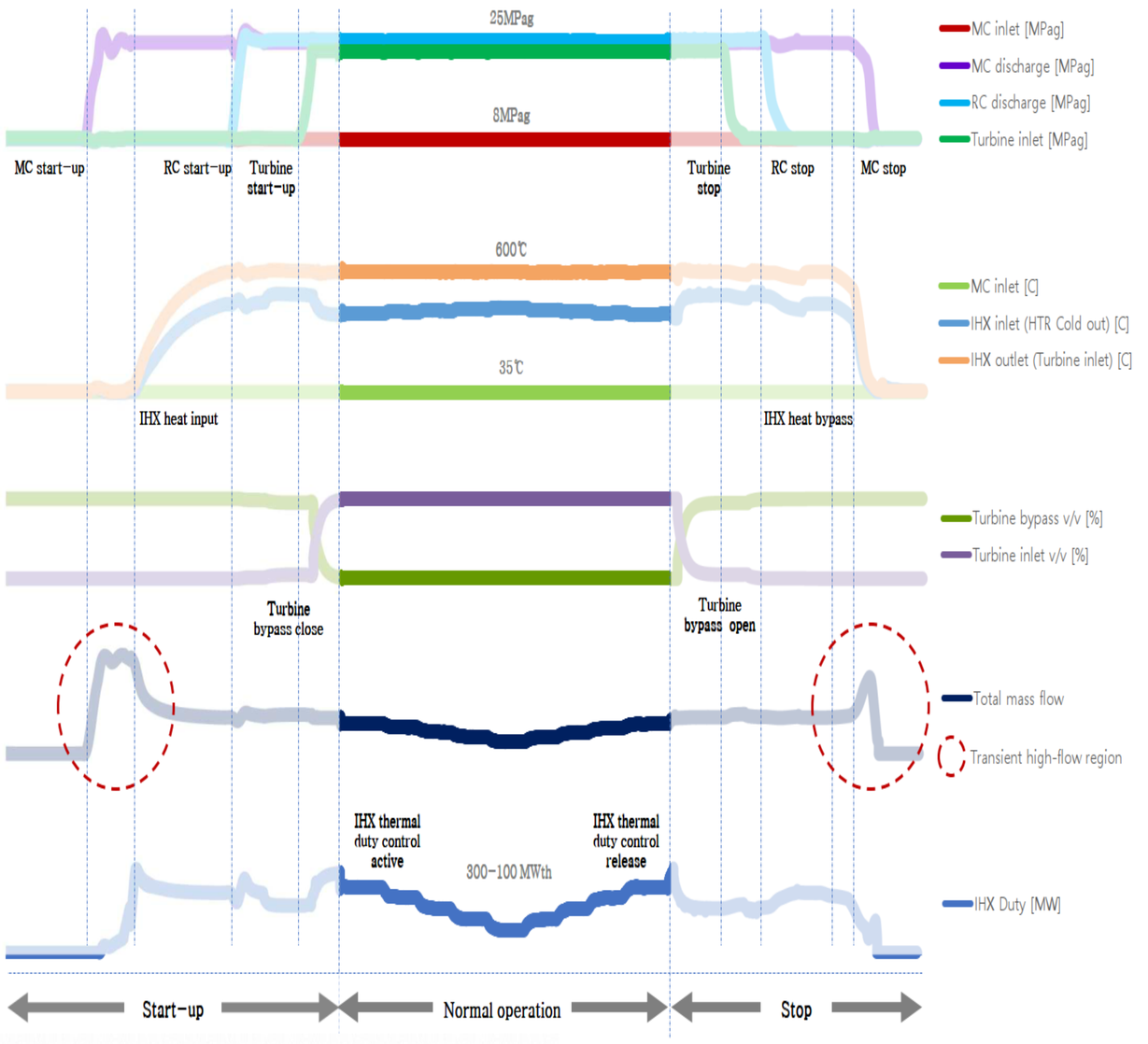
❖ ***Simulation Model in Aspen HYSYS V14 Dynamics***

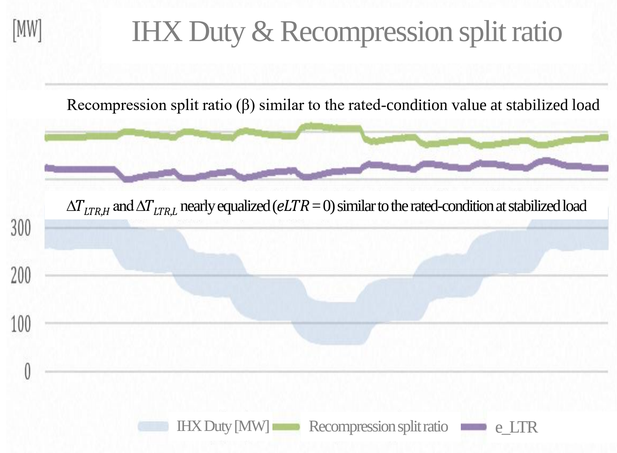


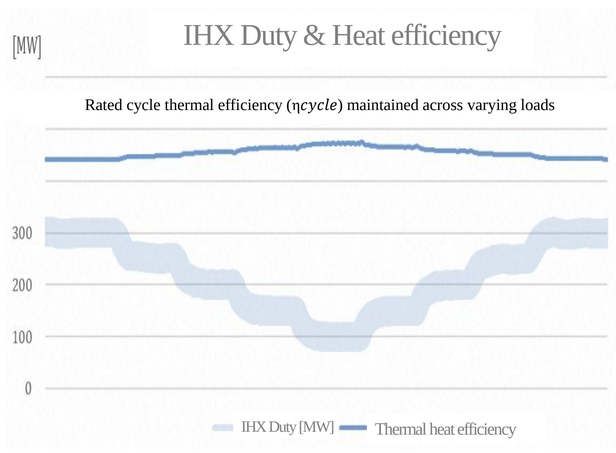
❖ ***Expected Operating Sequence***

Start-up	*Normal*	*Stop*
S1 Loop initial filling	N1 Change IHX thermal duty	P1 Release IHX thermal duty control
S2 Main Compressor start-up	N2 Maintain operating	P2 Turbine minimum flow / Stop
S3 IHX heat input	conditions	P3 Stop Recompressor
S4 Recompressor start-up		P4 Bypass IHX heating
S5 Turbine minimum-flow		P5 Stop Main Compressor
S6 IHX thermal duty control		P6 System stopped state

Applicability Assessment Results







Conclusion

❖ ***Control Logic for Stable Operation across Start-up, Normal and Stop***

❖ ***Maintaining Cycle Thermal Efficiency Similar to the Rated Condition***

❖ ***Necessity of Considering Transition in Actual System Design***

Acknowledgements

This research was supported by the National Research Foundation of Korea (NRF) and funded by the ministry of Science, ICT, and Future Planning, Republic of Korea (grant numbers RS-2021-NR056168)