



Design of a separation system for the closed-loop superheated steam drying process in the paper industry

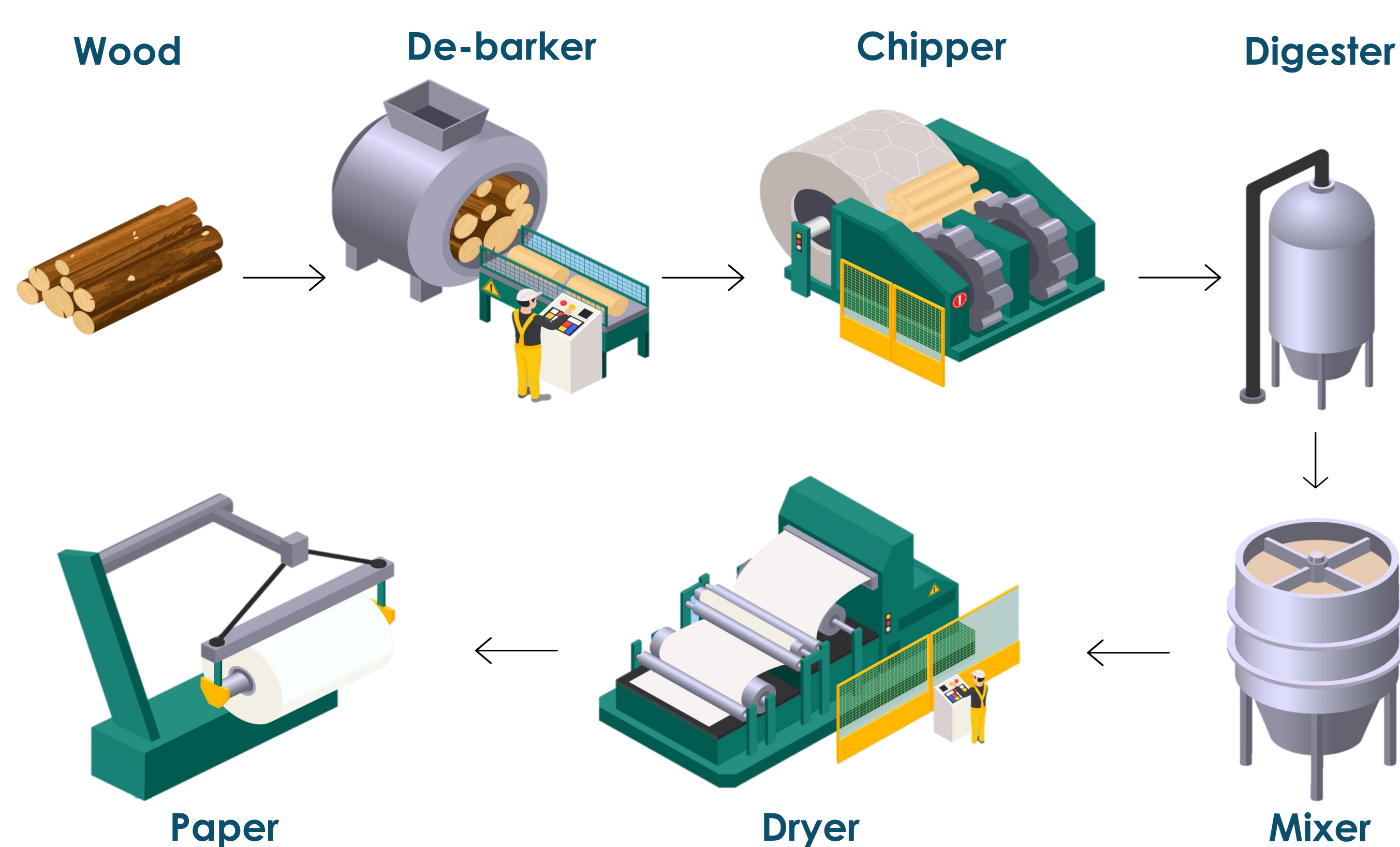
Felipe de Oliveira ^{a*}, Marcel Meinders ^b, Edwin Zondervan ^a

^a University of Twente, Drienerlolaan 5, 7522 NB, Enschede

^b Wageningen University & Research, Droevendaalsesteeg 4, 6708 PB, Wageningen

Introduction

The paper industry is highly energy-consuming with the paper drying step accounting for 70% of the energy requirements, i.e. there is scope for improvement [1], [2].



Scheme of the main units of a typical paper-making process

Superheated steam drying can reduce energy use by 70% compared to traditional air drying [2]. As the paper is dried, the steam is contaminated, causing operational issues and reducing the efficiency of the process. Effective contaminant control is needed for a closed-loop process.

Objectives

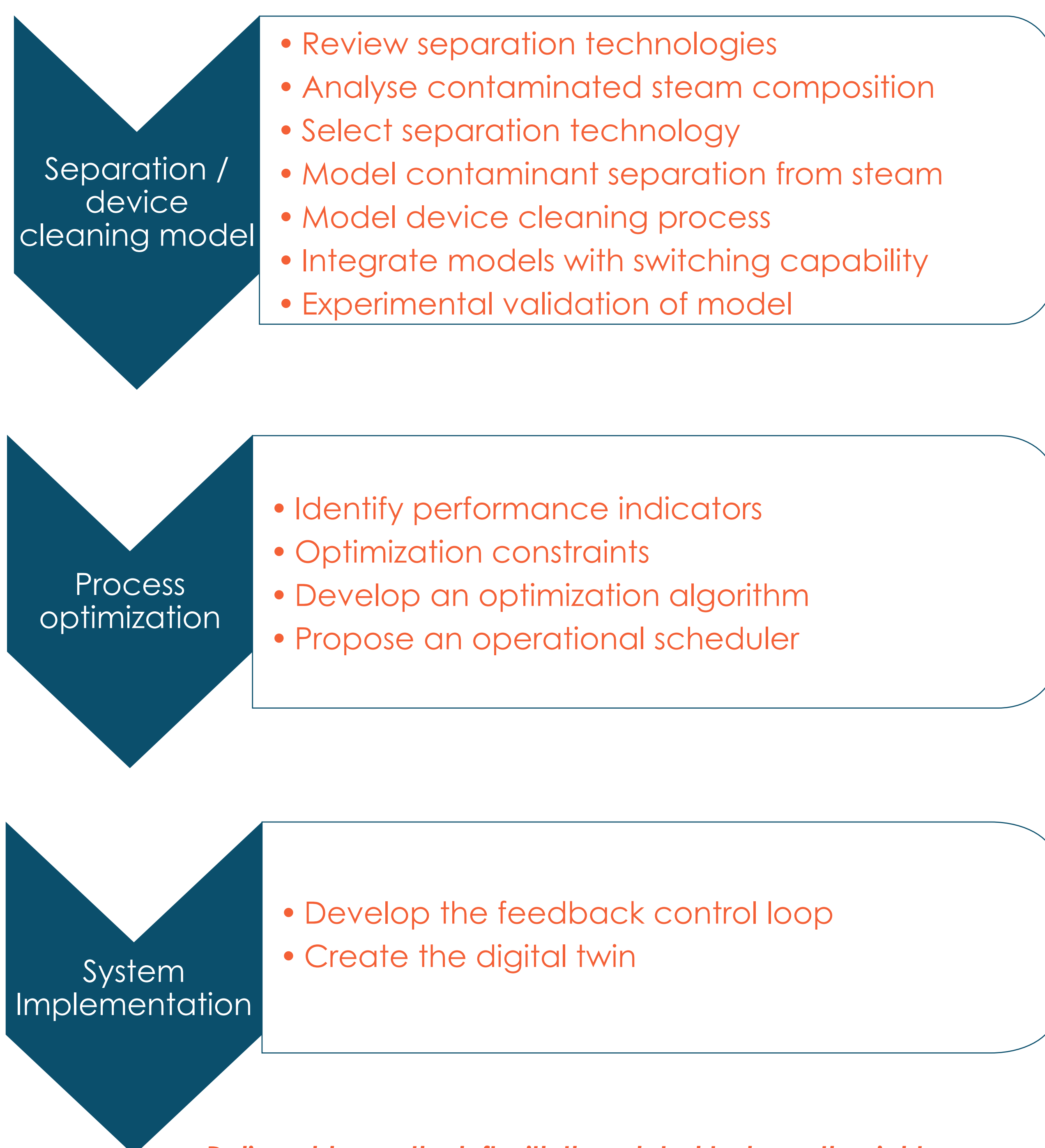
- Validated contaminant separation model with device cleaning mode
- Optimized operational scheduler to minimize energy use and CO₂ emissions
- Feedback control loop
- User-friendly digital twin

References

- [1] – Eurostat: Final energy consumption in industry - detailed statistics – Retrieved from: https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=Final_energy_consumption_in_industry_-_detailed_statistics#The_largest_industrial_energy_consumers_in_the_EU [Accessed on 2024-07-05]
- [2] – Wilk, V., Knöttner, S. B., Drexler-Schmid, G., & Barz, T. (2023). Superheated steam drying for paper production: process efficiency assessment. In Proceedings of ECOS 2023: 36th International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems (pp. 1411-1421) <https://doi.org/10.52202/069564-0128>
- Units of the paper process scheme designed by Freepik

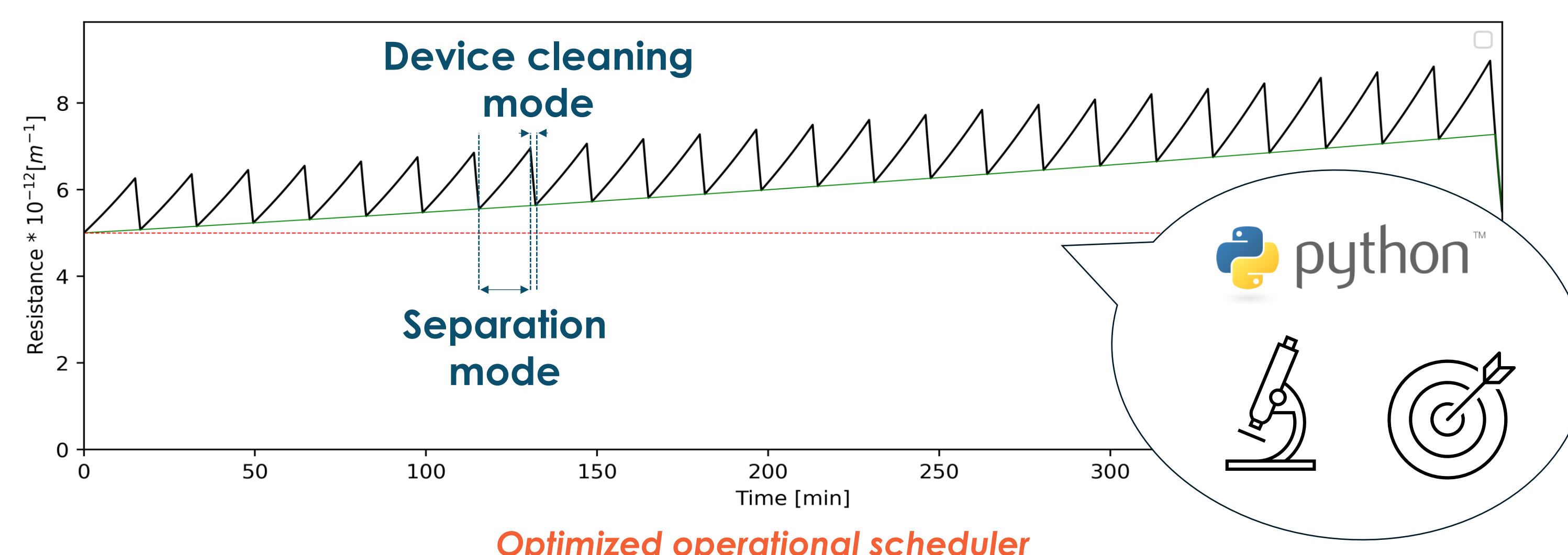
Methodology

To achieve the objectives, the following tasks will be carried out:

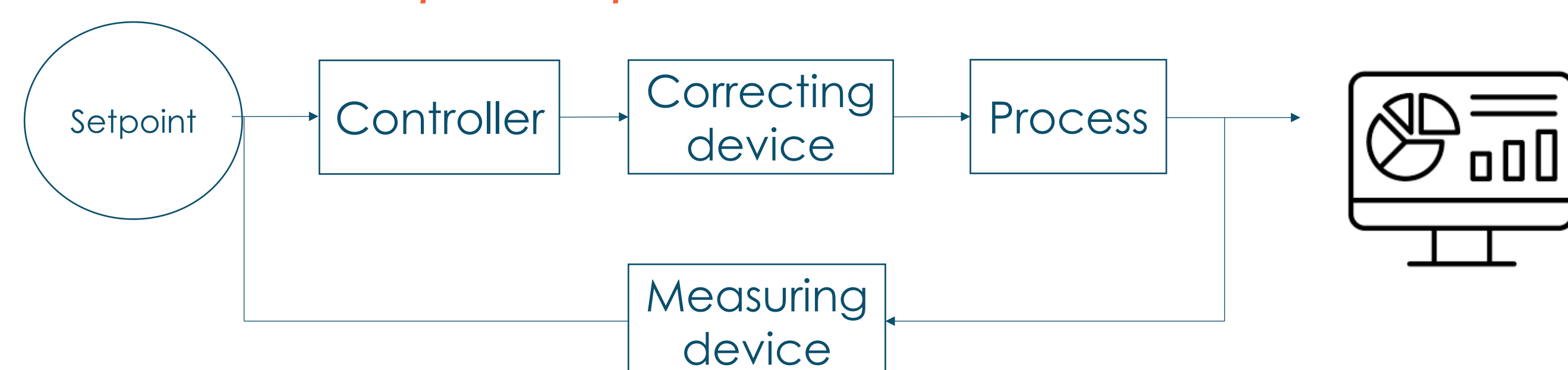


Deliverables on the left with the related tasks on the right

Expected outcomes



Optimized operational scheduler



Feedback control loop and digital twin

Questions / Tips

Feel free to ask or send me an e-mail using the QR code below

