

# Modified mono polar plates – an approach for metal free stack ends in vanadium flow batteries

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## Introduction

Resistance at stack end is important to performance and longevity of flow battery stacks

Two major contributions:

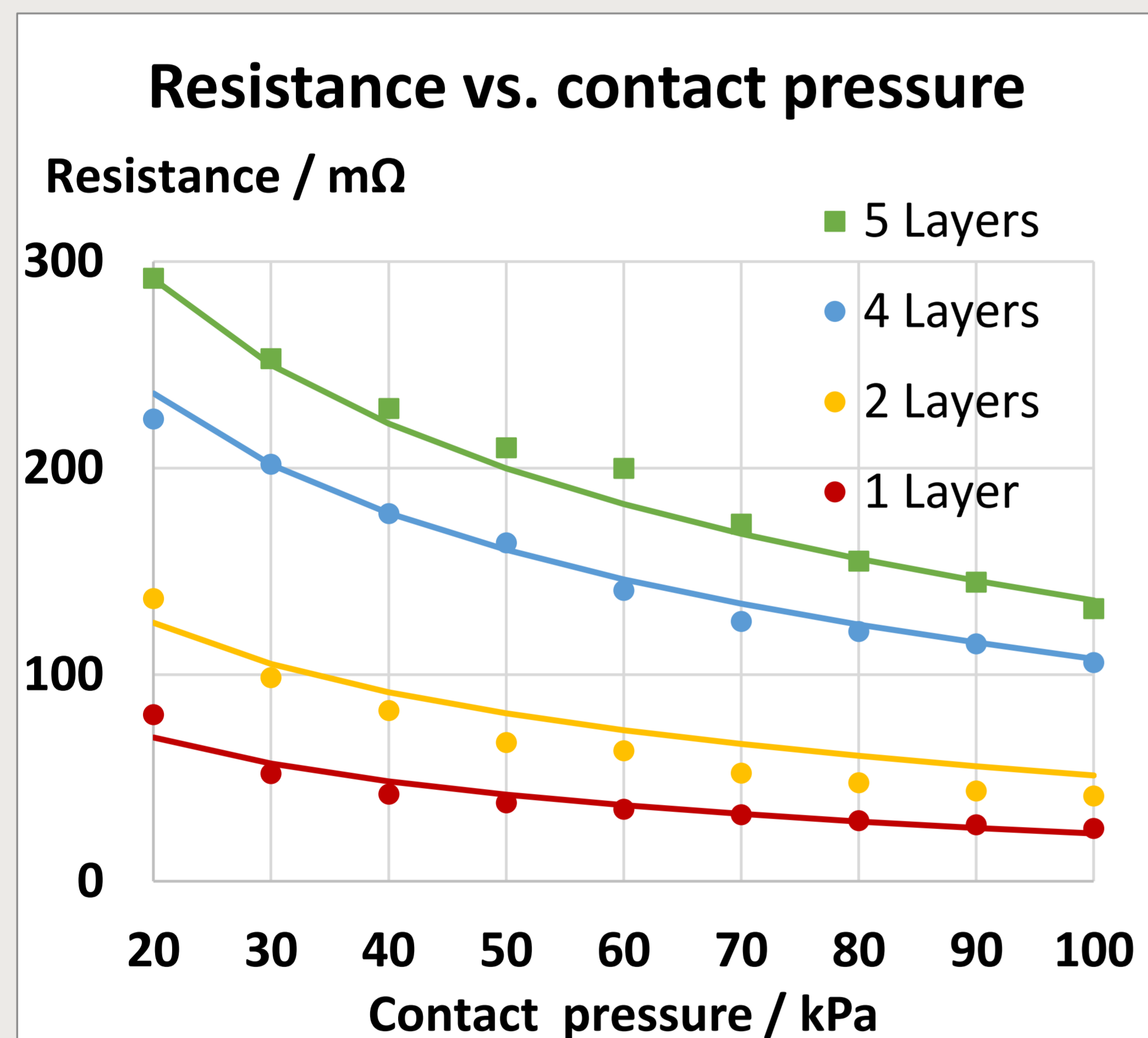
- Material (Current collector and mono polar plate)
- Contact resistance Between current collector and mono polar plate

## New approach:

Avoid contact resistance  
By using multiple or thick mono polar plates and therefore metal free stack ends

## Resistance of mono polar plates

In order to estimate the electrical resistance of thick or stacked mono polar plates, measurements of commercial mono polar plates (SIGRACELL PV15 by SGL Carbon) were made.

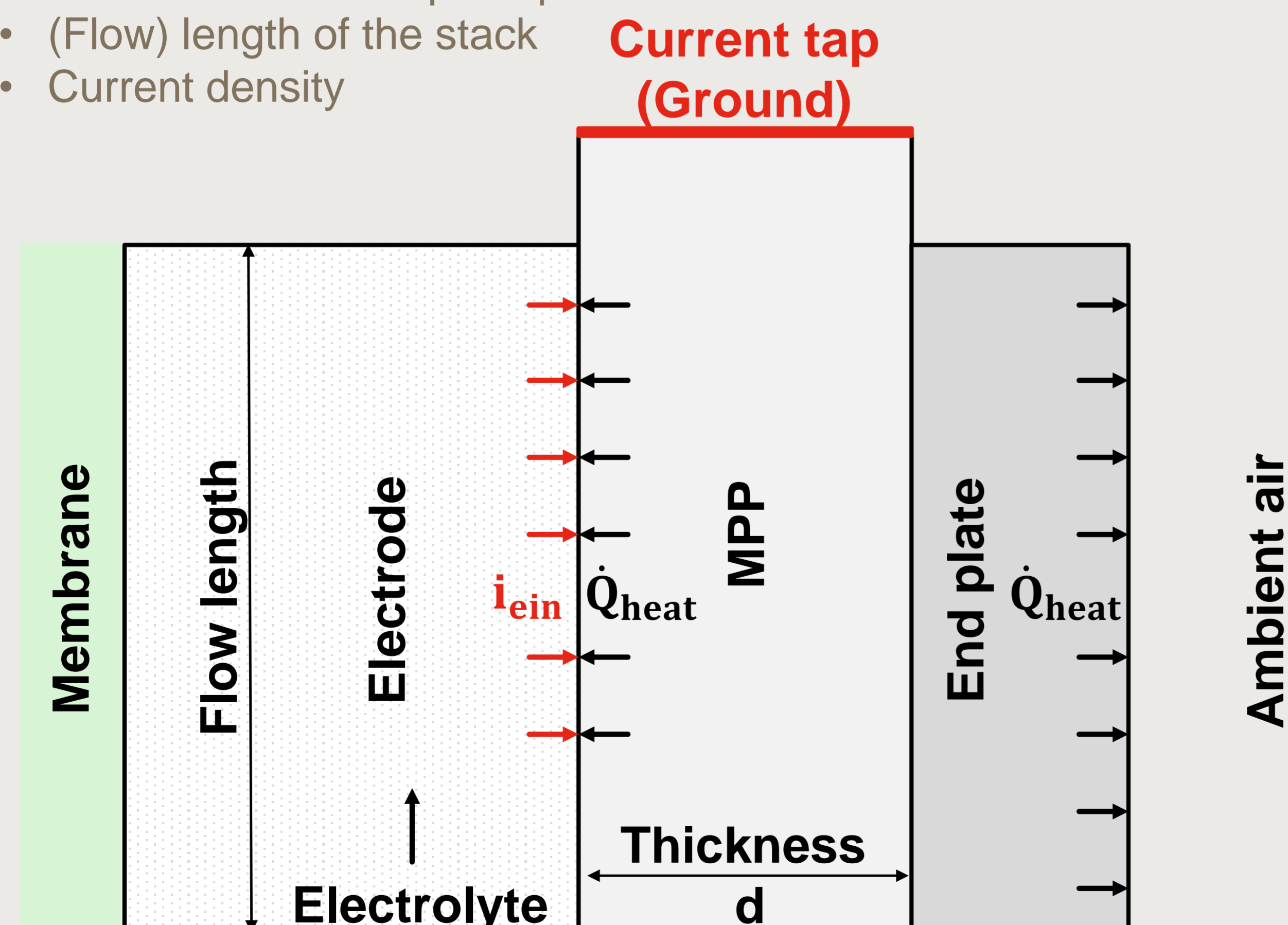


## Simulation

Voltage loss, Joule heating and temperature increase of the electrolyte were simulated with COMSOL Multiphysics

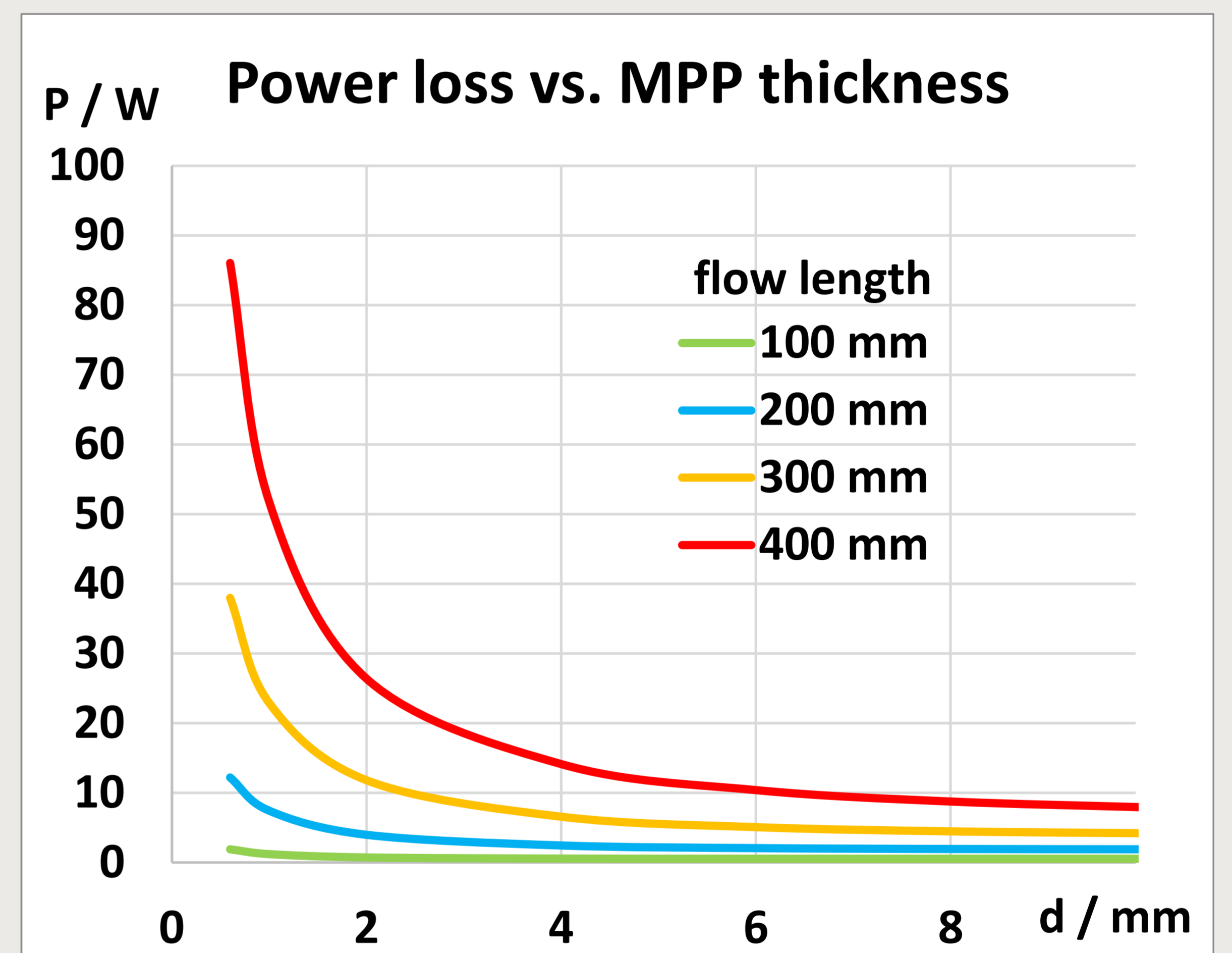
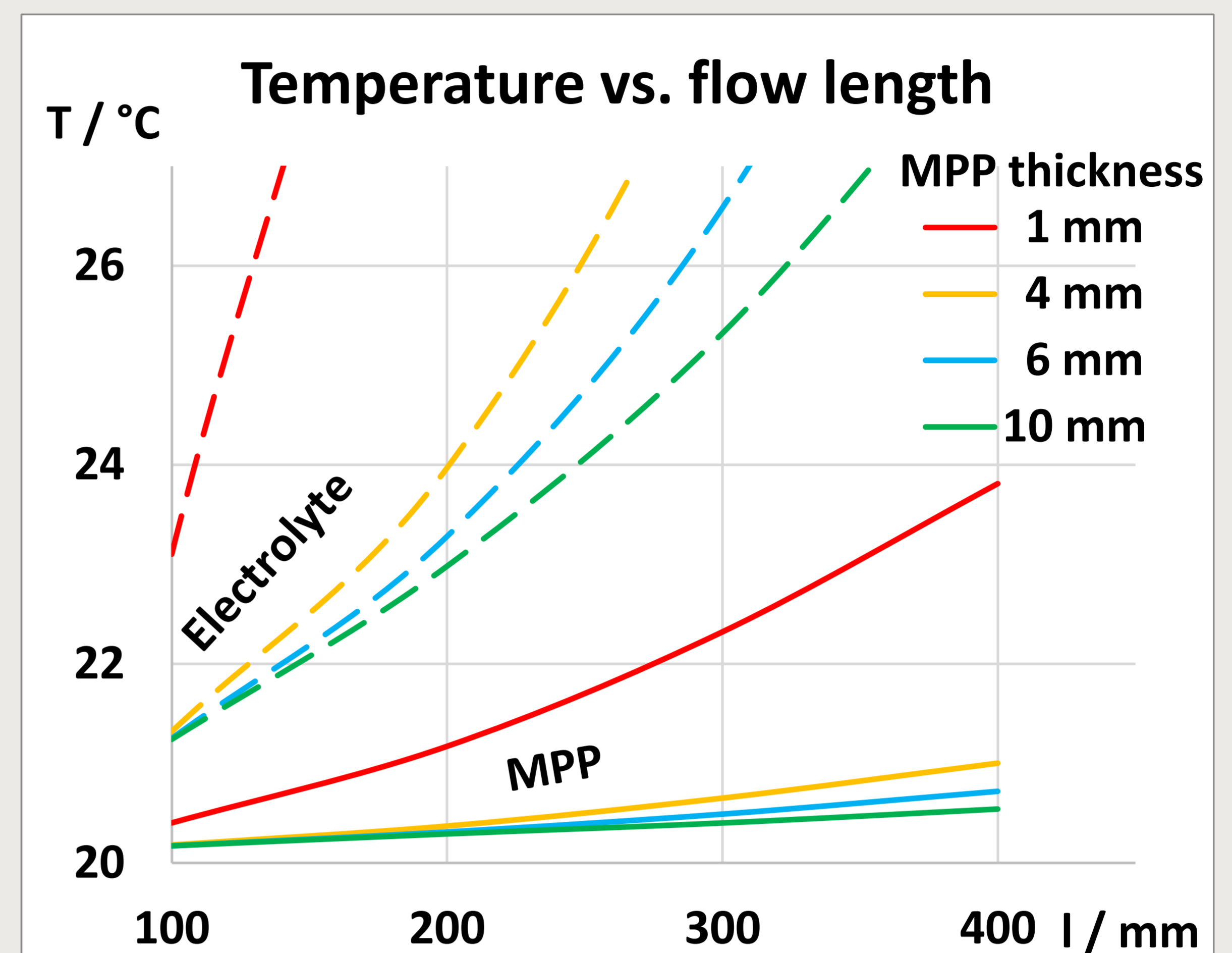
Variations included

- Thickness of mono polar plate
- (Flow) length of the stack
- Current density



## Results

Temperature increase in electrolyte and MPP and power loss become negligible with thick MPP and short flow length



## Assumptions

Current density 100 mA cm<sup>-2</sup>  
Flow factor 5  
SOC 50 %  
Current tap across the entire depth (2D simulation)

## Conclusion

A concept for a metal free stack end is presented.

A modified MPP with an adapted geometry (high thickness and low flow rate) can be beneficial in terms of resistance and power loss.

## Acknowledgements

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