RICH Gas System
Design Parameters

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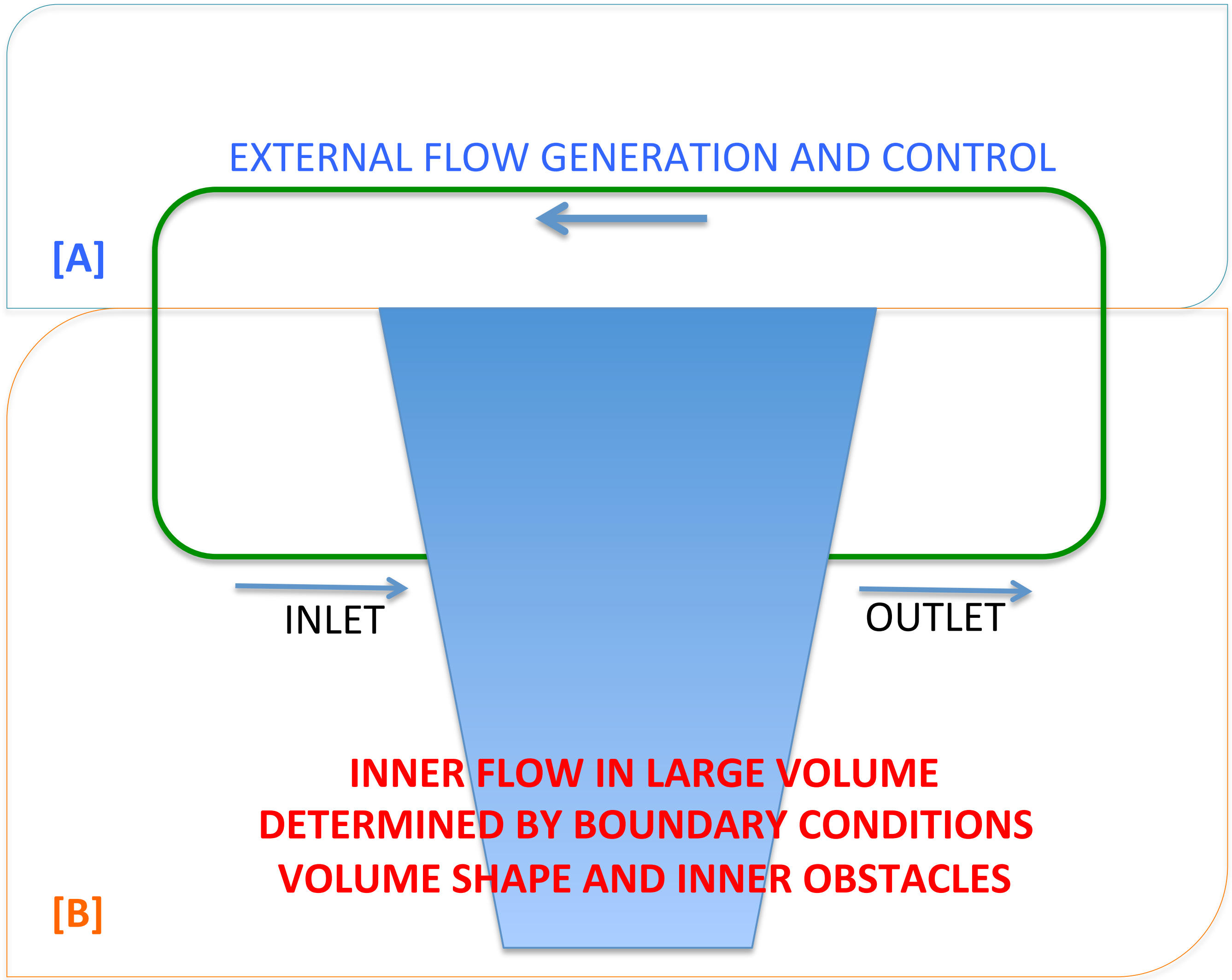
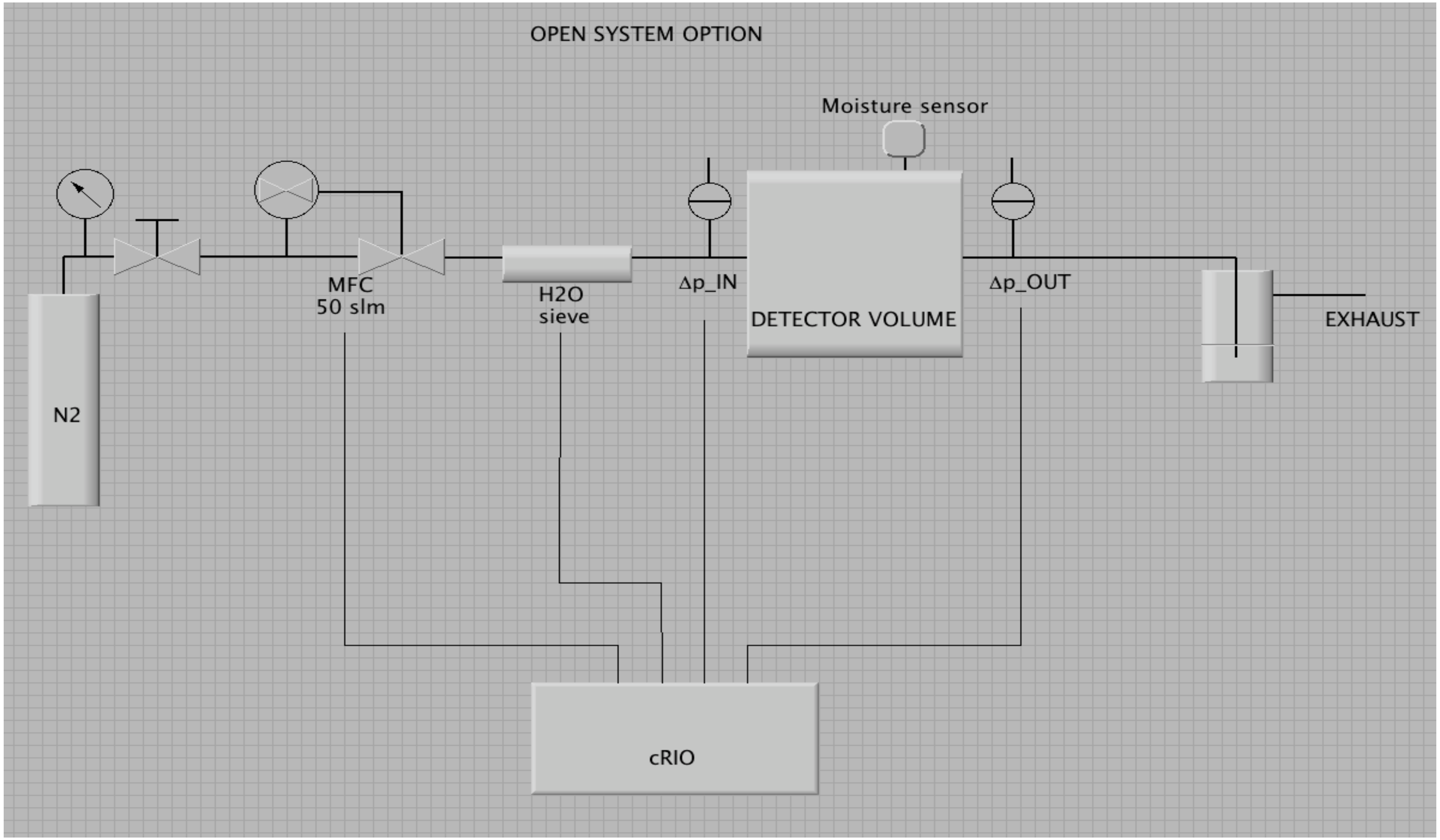
DRY GAS SYSTEM – GENERAL MODEL

[TWO LOGICAL BLOCKS]



DRY GAS SYSTEM BASELINE LAYOUT

[A] FLOW GENERATION AND CONTROL IN OPEN CIRCULATION OPTION



System is flow-driven, i.e. the overpressure is determined by total impedance only.
Active controls regulate flow according to overpressure monitors.

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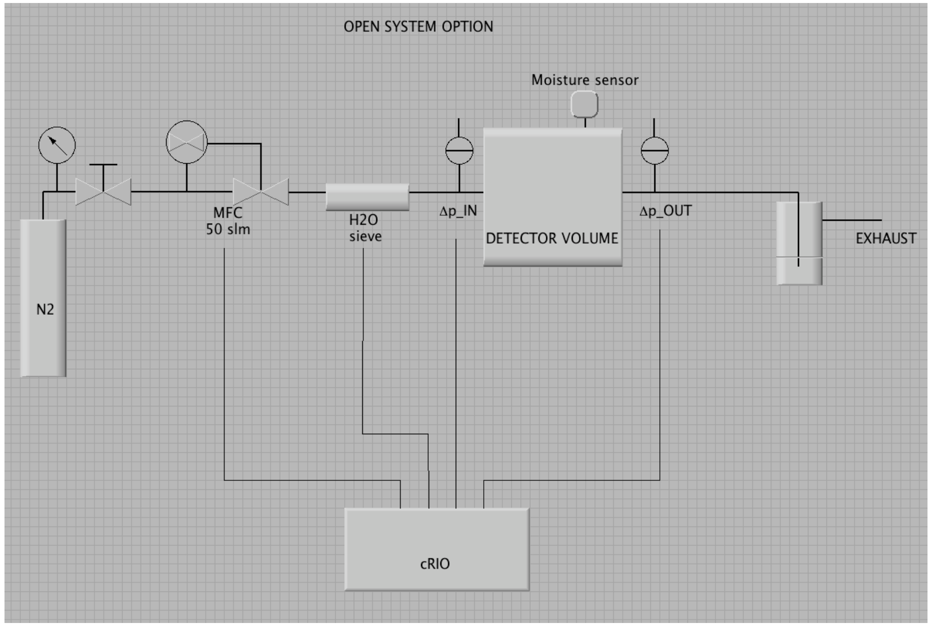


requirements:

Volume of interest ~ 5 m^3

flow:
- dry N2 sufficient to keep H2O concentration below some prefixed level
- 10 nlm ~ 2 volumes/day

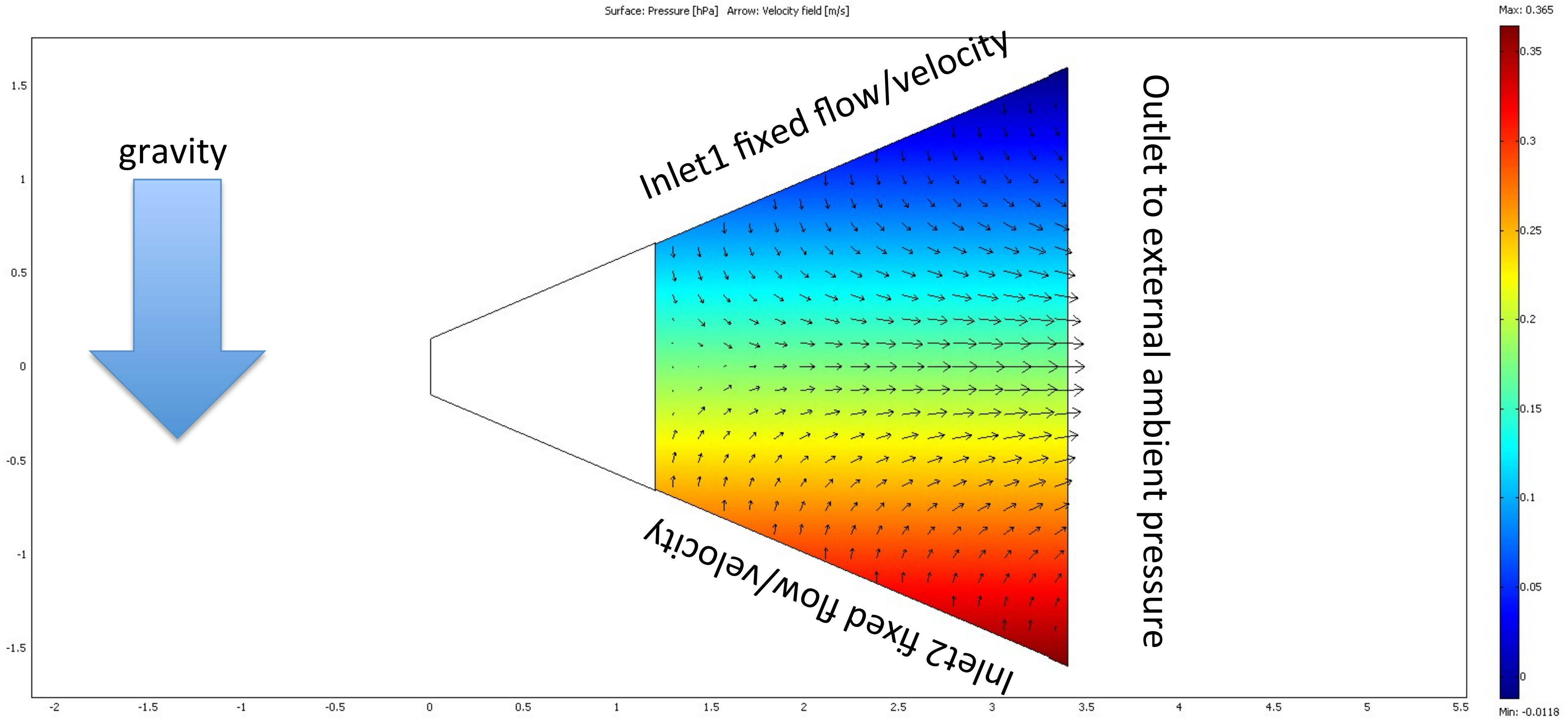
pressure:
wanted levels of ~30-40 mbar are not expected to affect mechanics significantly

components:
[1] MFC e.g. 50 slm F.S.
[2] single inlets from two sides w/ internal manifolds
[2] single outlet from one side w/ internal low impedance manifold
[3] dP for overpressure measurement at chamber inlets and outlets
[4] H2O sensor(s) at inlets [0-100 PPM]
[5] Hydrosorb Molecular sieve(s) for H2O filtration

Central controller: e.g. NI-cRIO

2D idealized model

> inlets linearly distributed along two sides
> outlet linearly distributed along one side



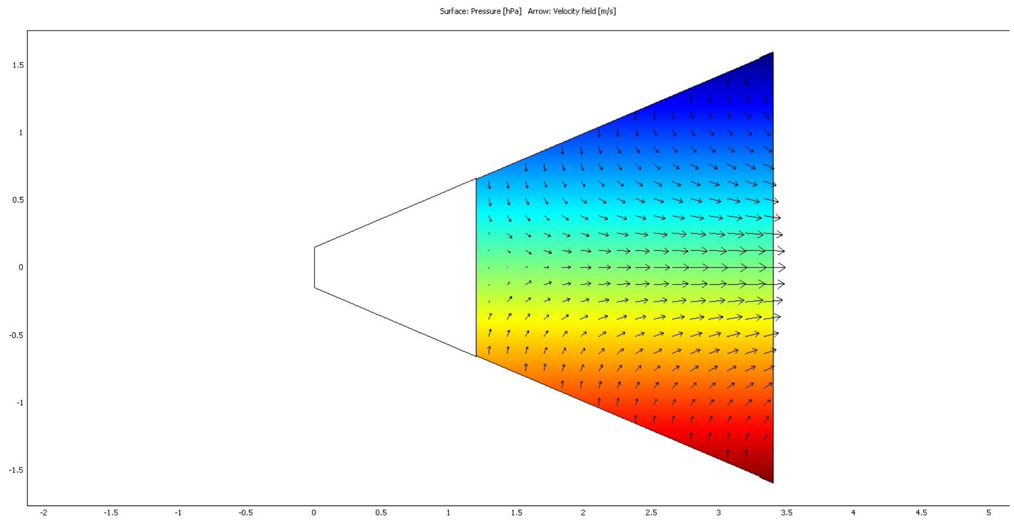
Model is extremely simplified:

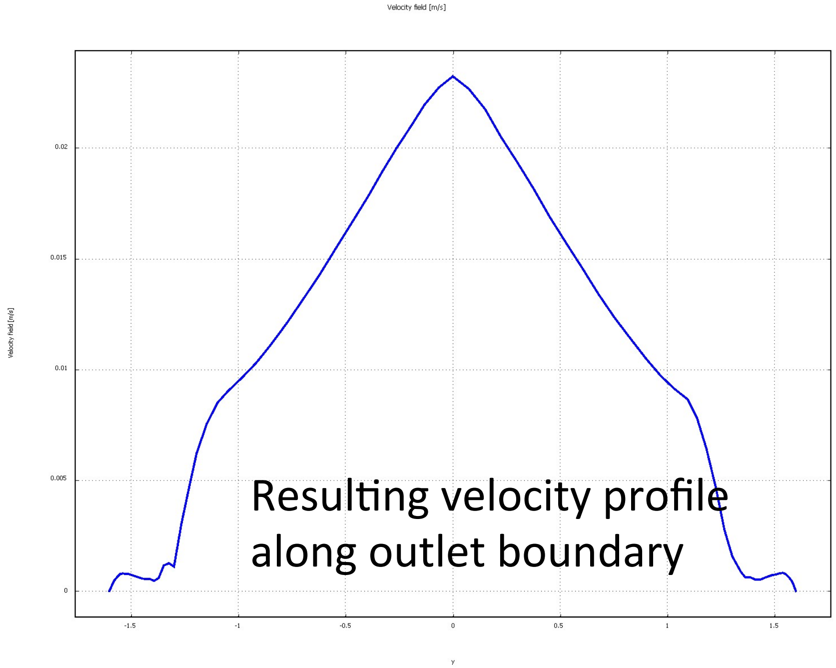
inlets are very close to reality (two long inward manifolds)

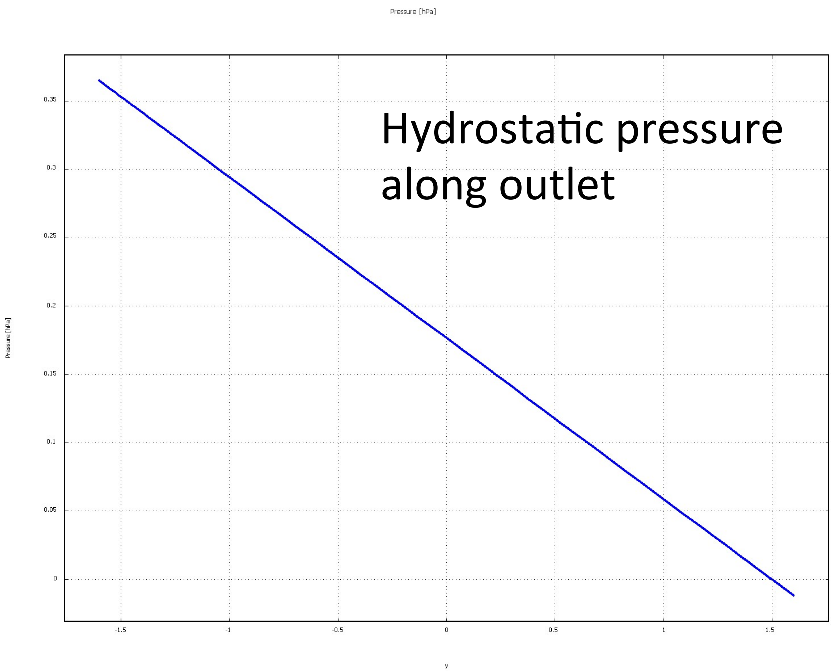
outlet is to be improved with impedance in order to get realistic inner pressure rise

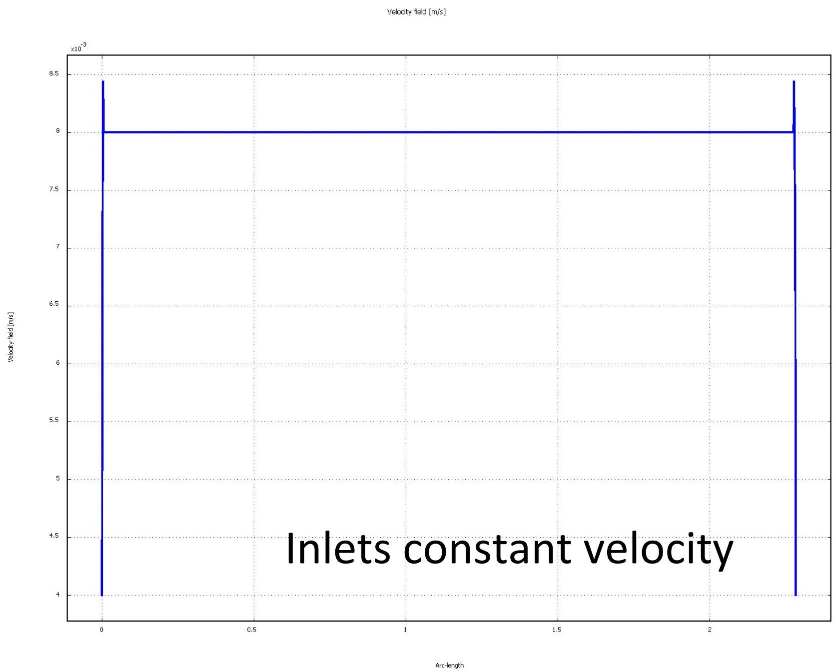
Overall solution features are realistic and ensure expected outward gas flow

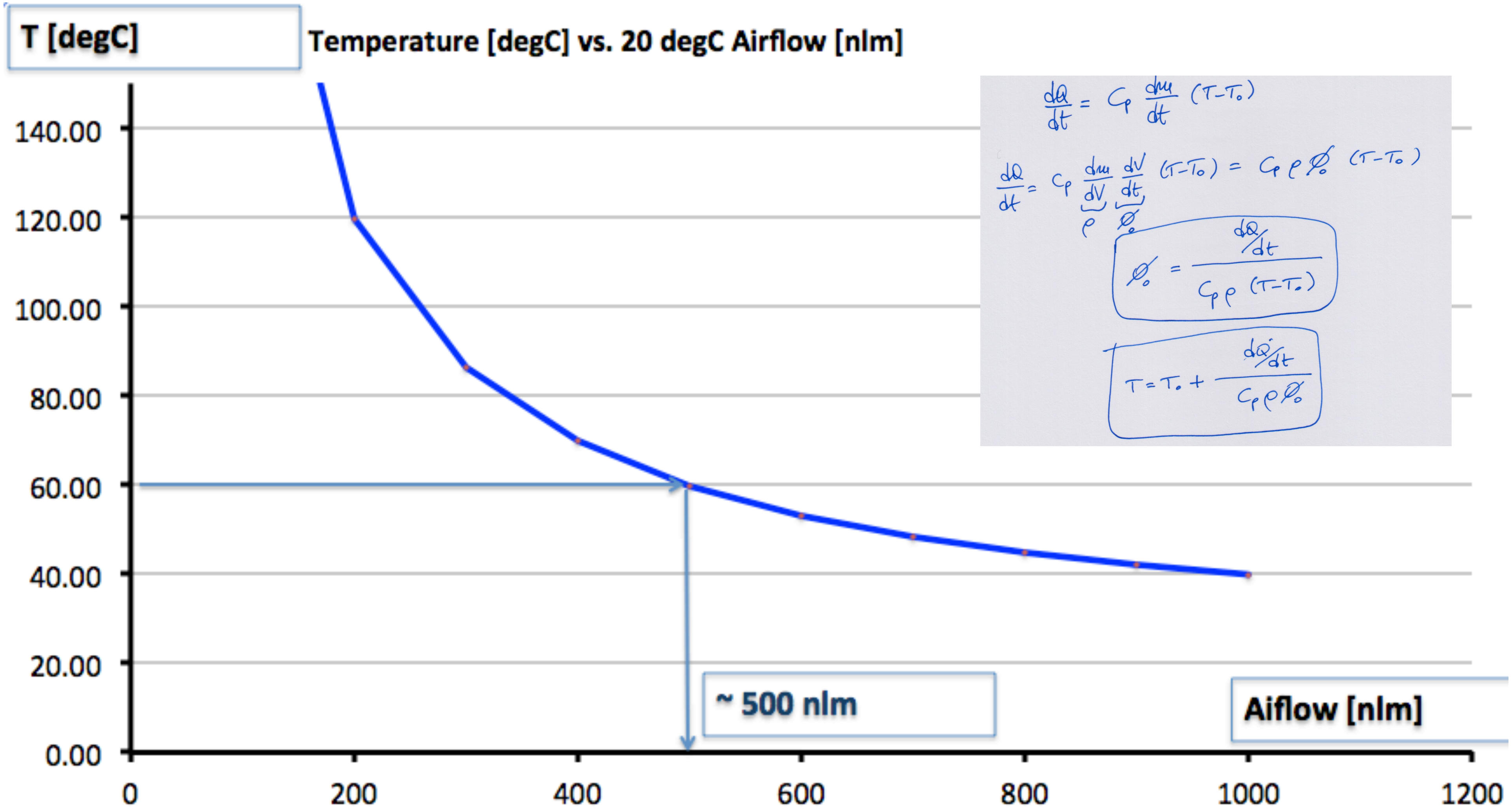
Boundary conditions











Thermal power dissipation from ~ 0.5 m^3 volume by means of ambient airflow.

Integral equations show that a temperature below 60 degC would be kept in the volume with an airflow of ≳500 nlm.
This minimal flow could be kept ~10% higher in order to balance lower heat transfer coefficients due to the effective streamlines in the specific geometry.