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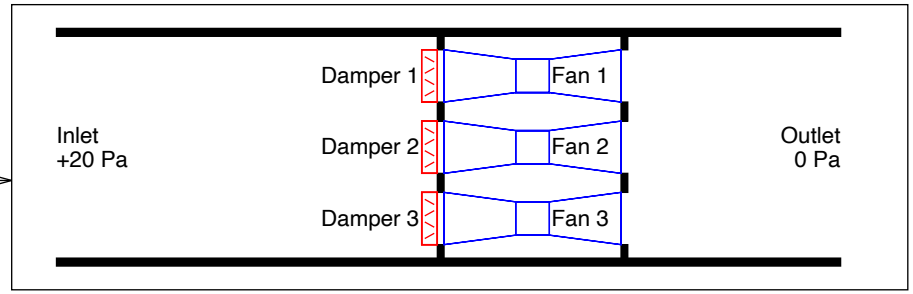

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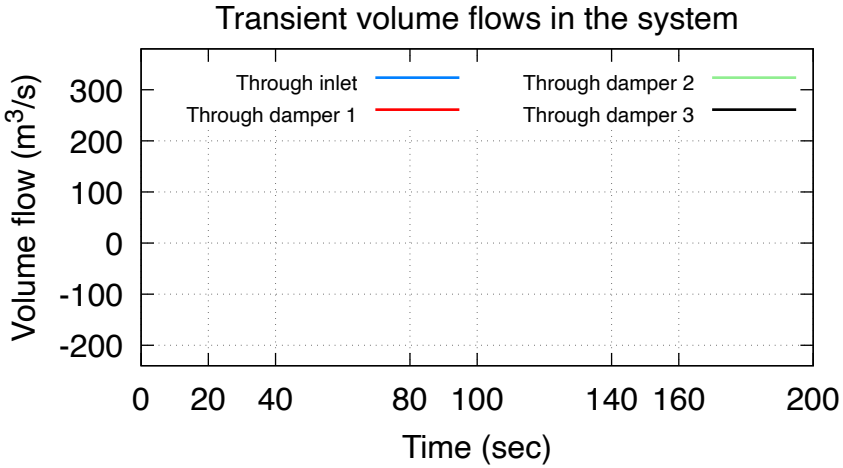

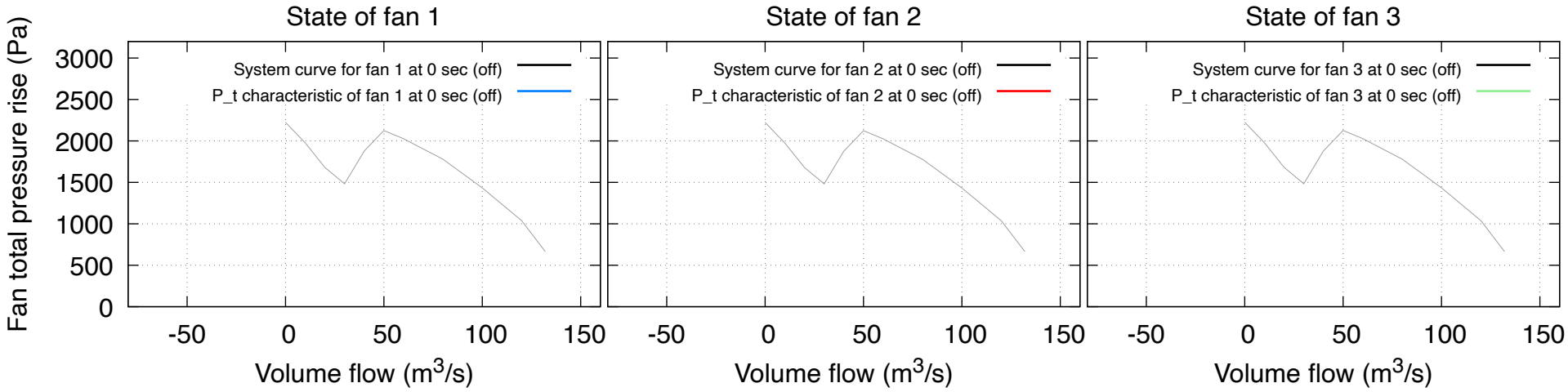

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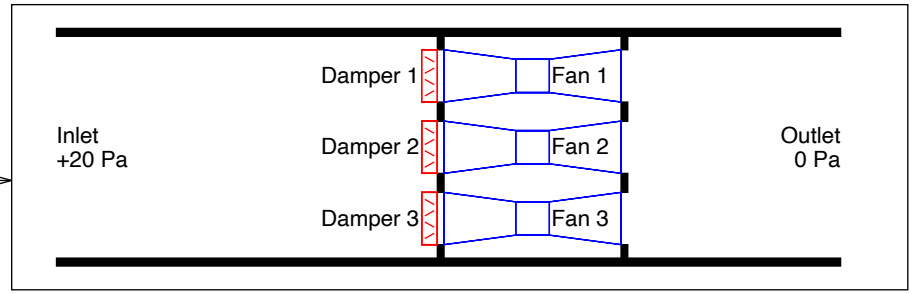

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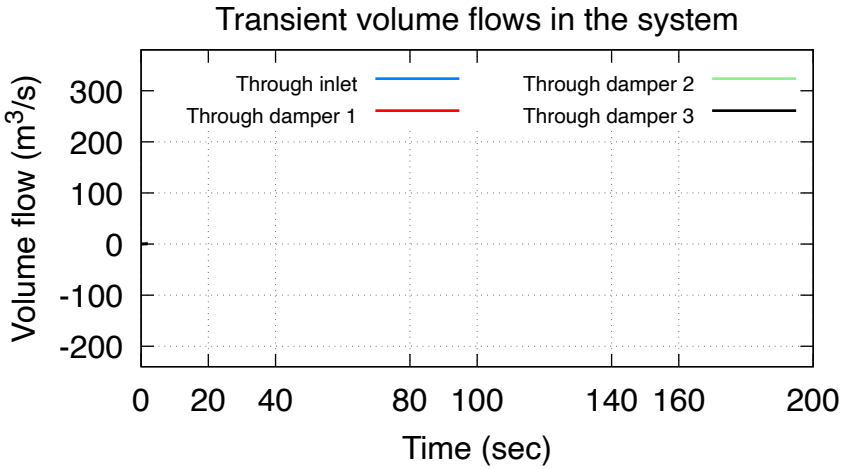

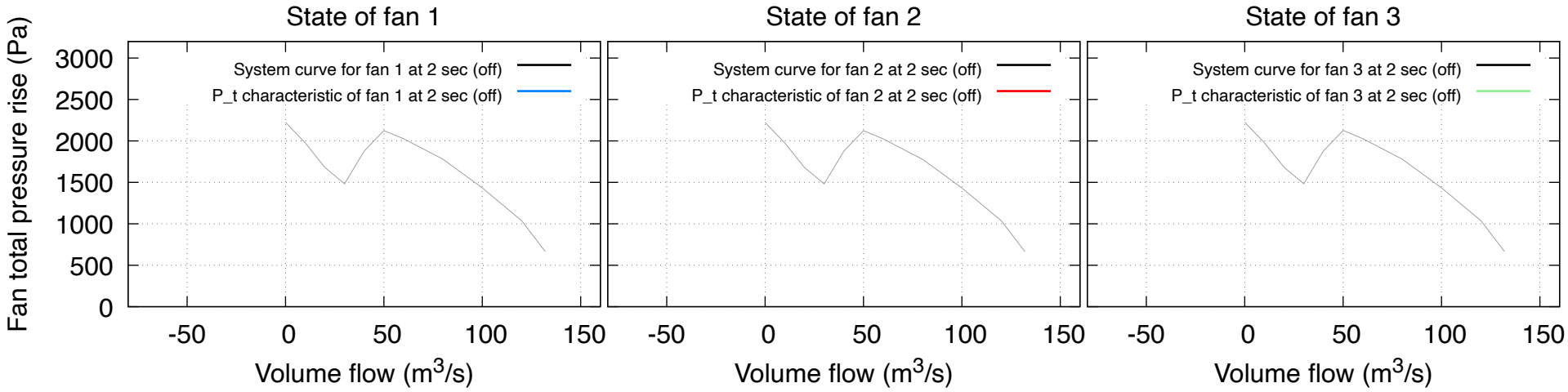

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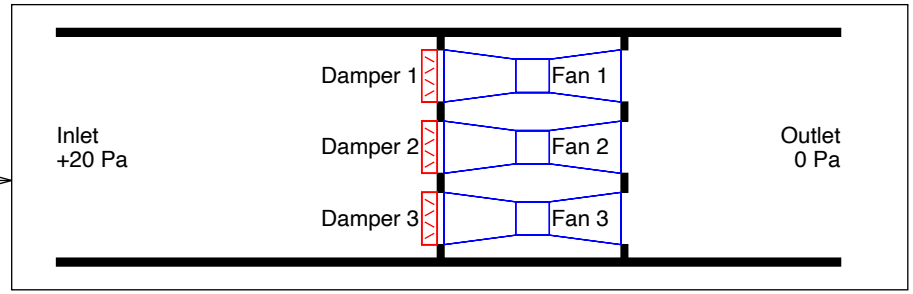

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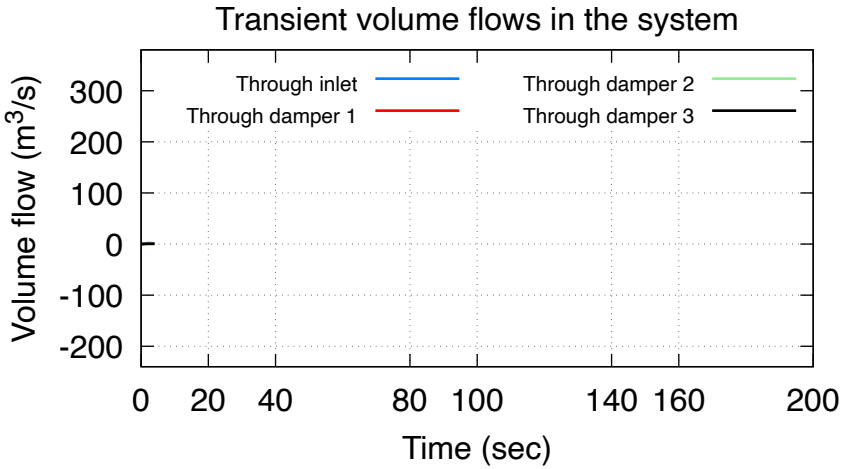

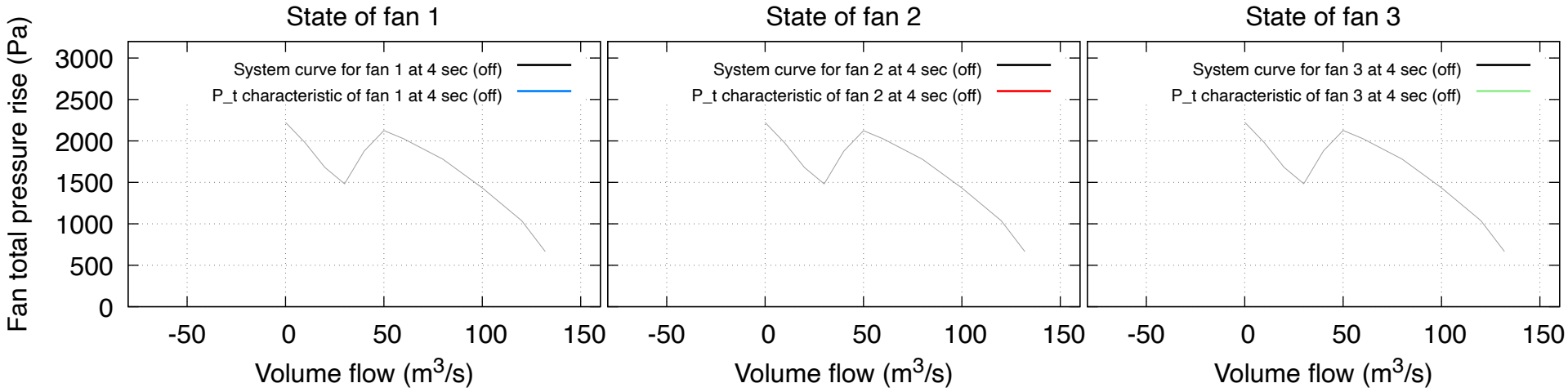

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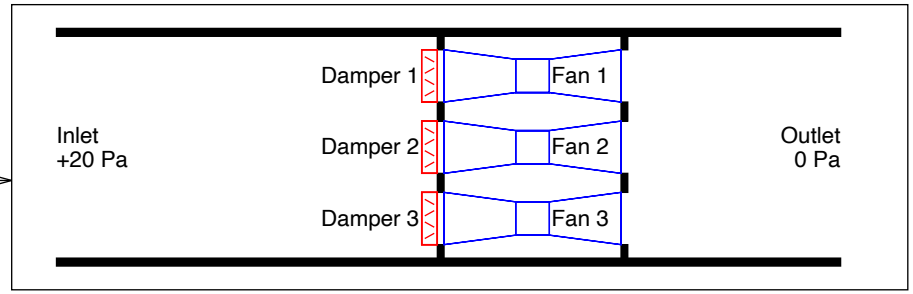

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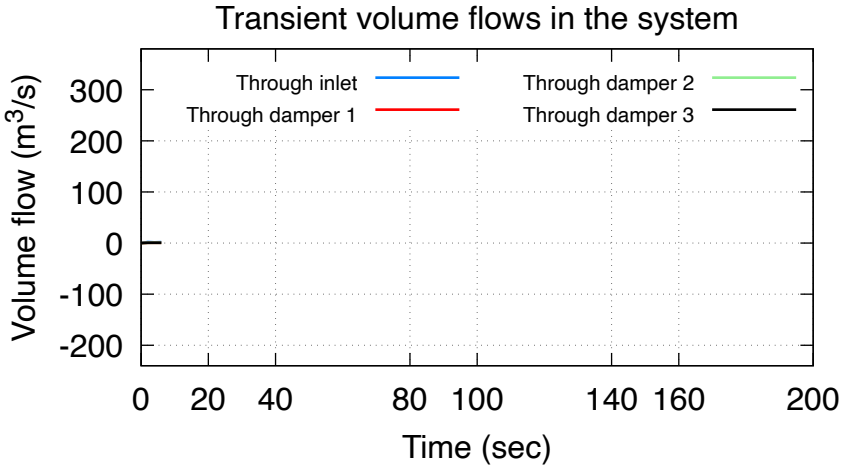

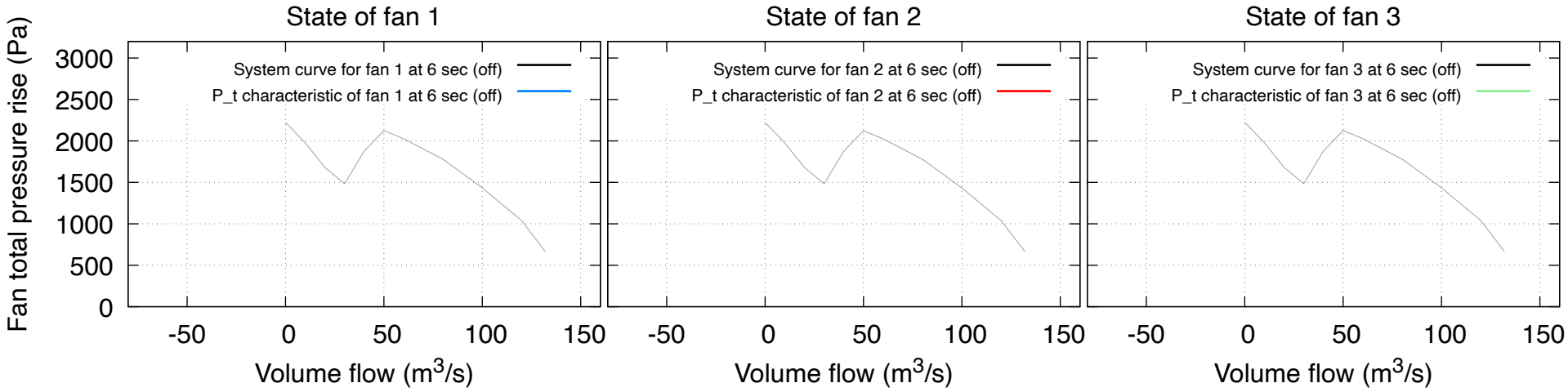

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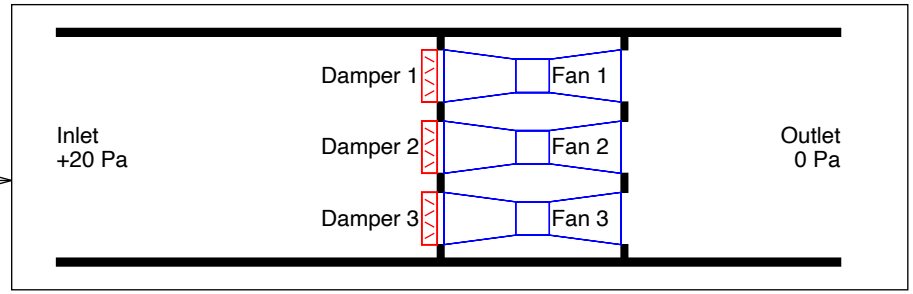

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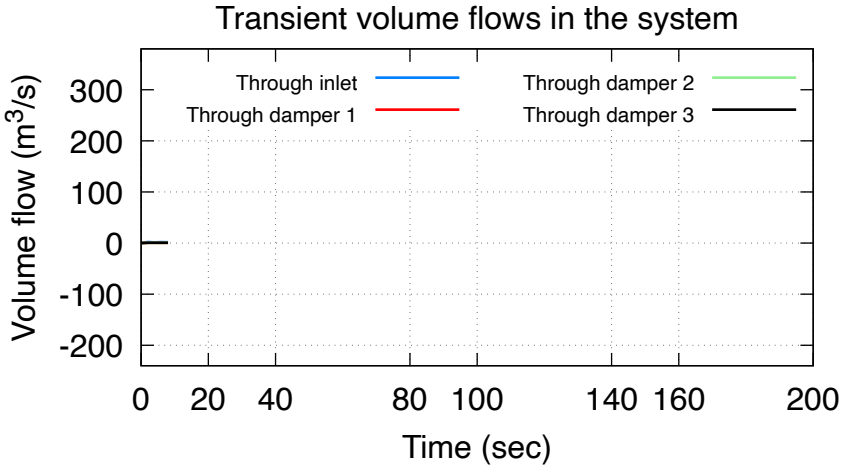

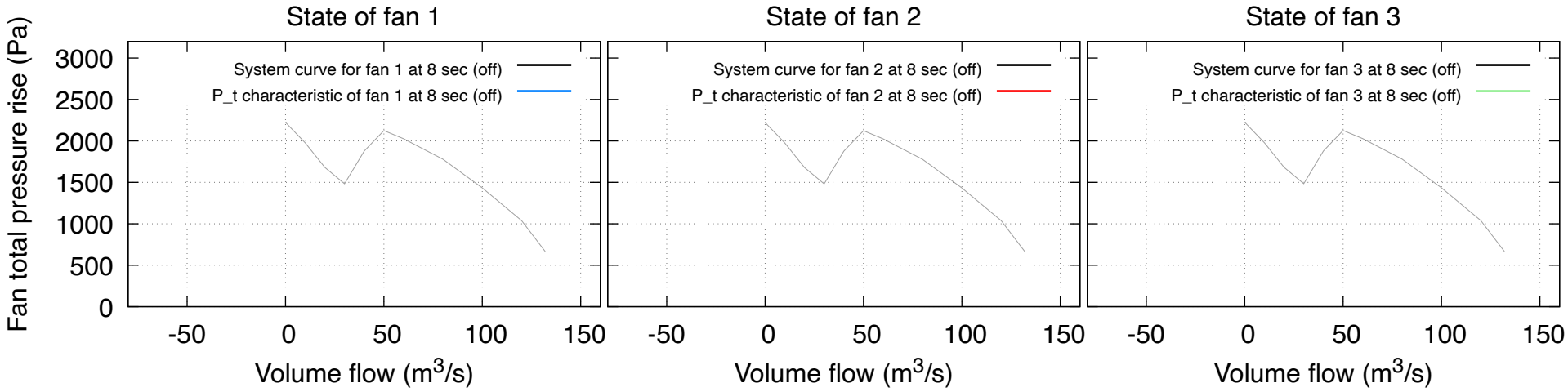

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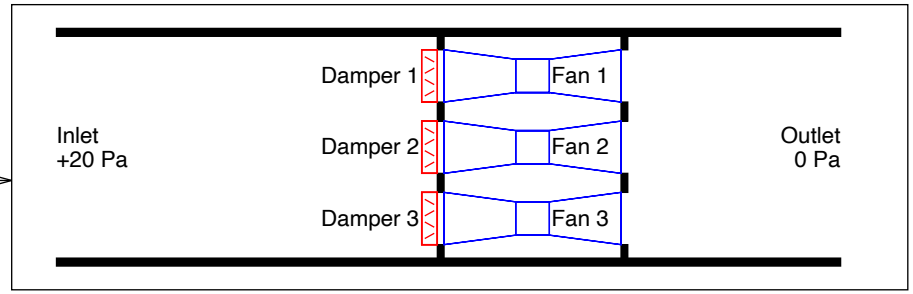

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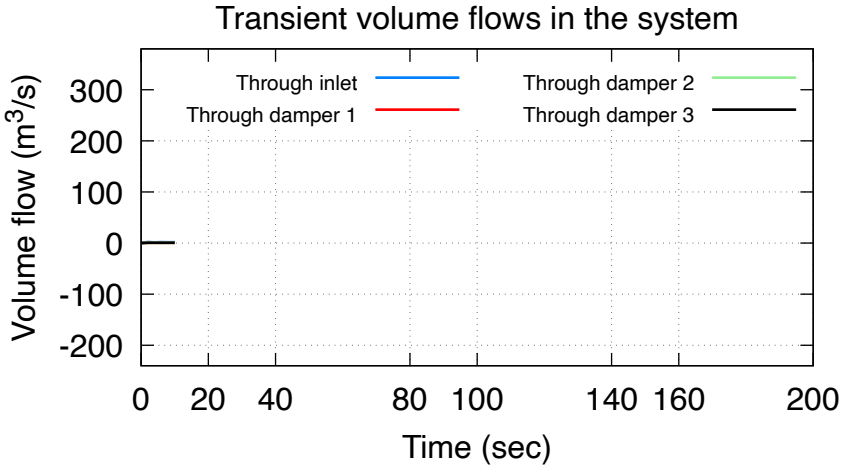

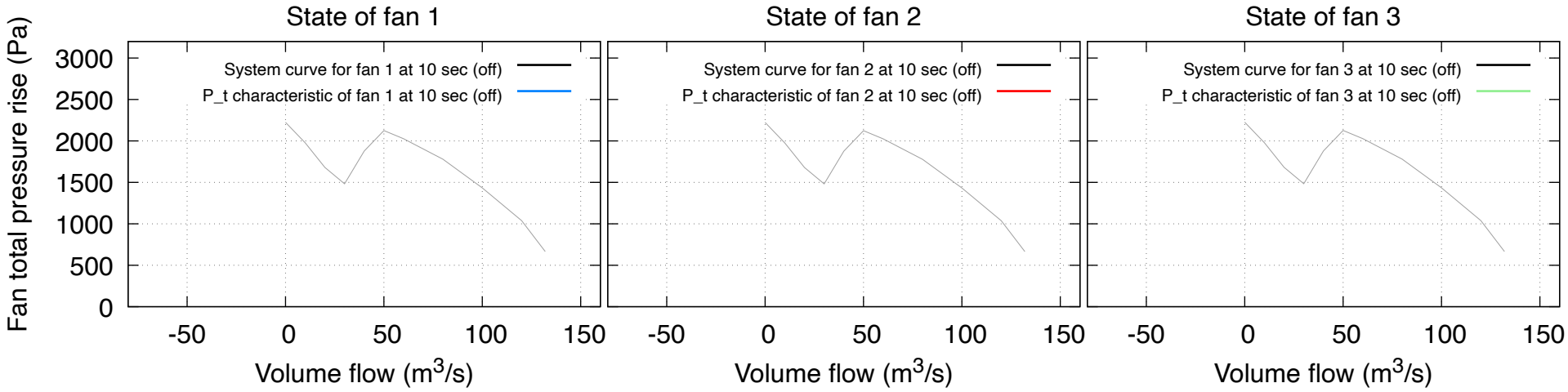

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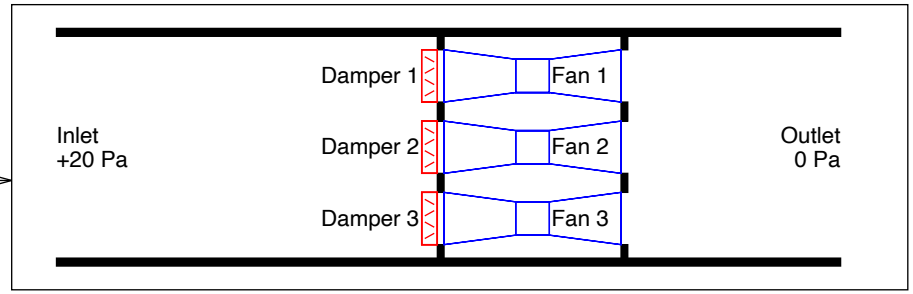

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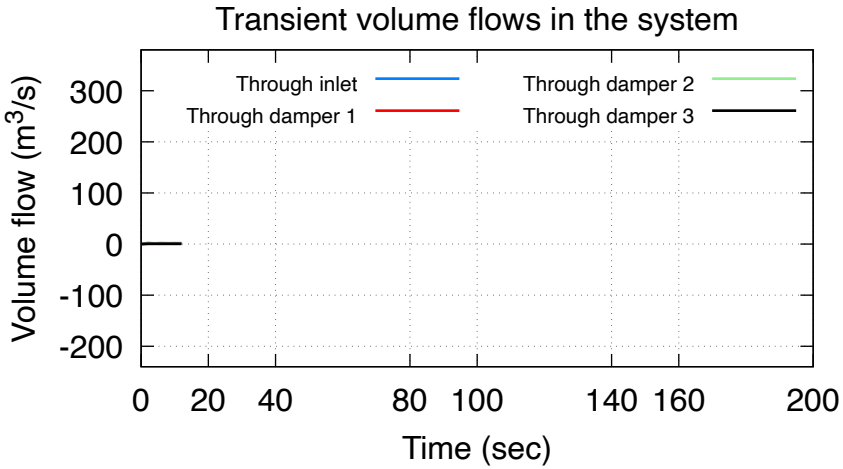

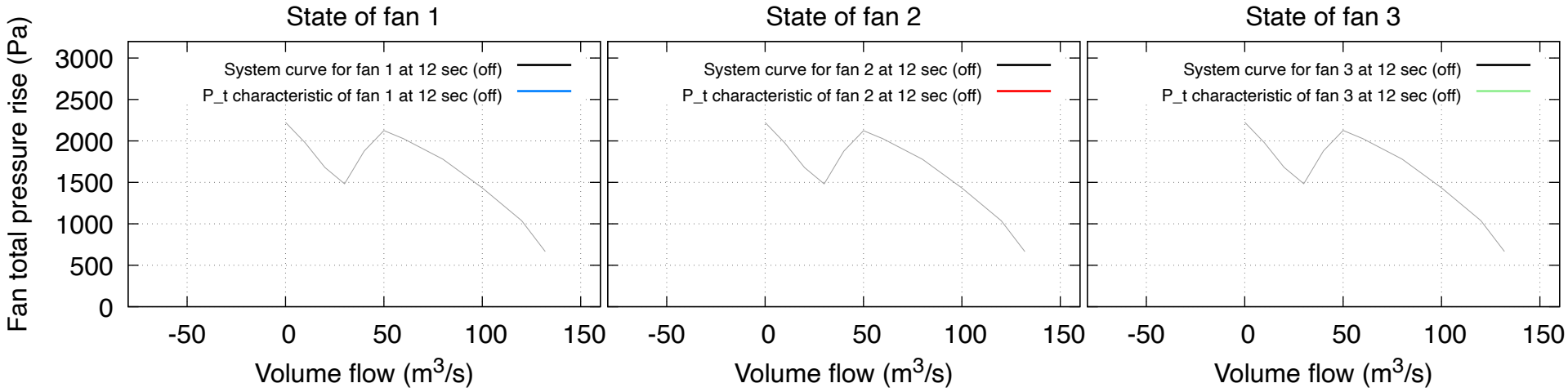

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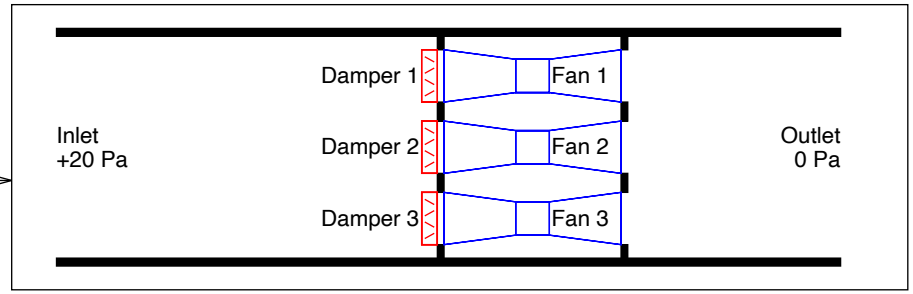

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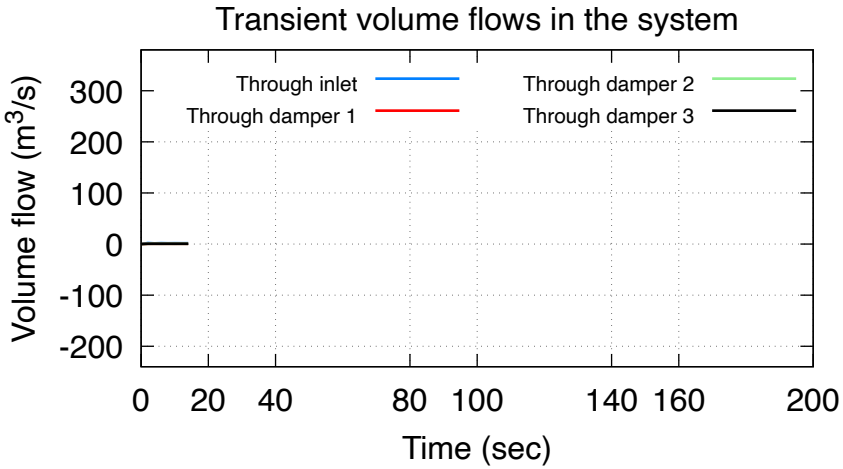

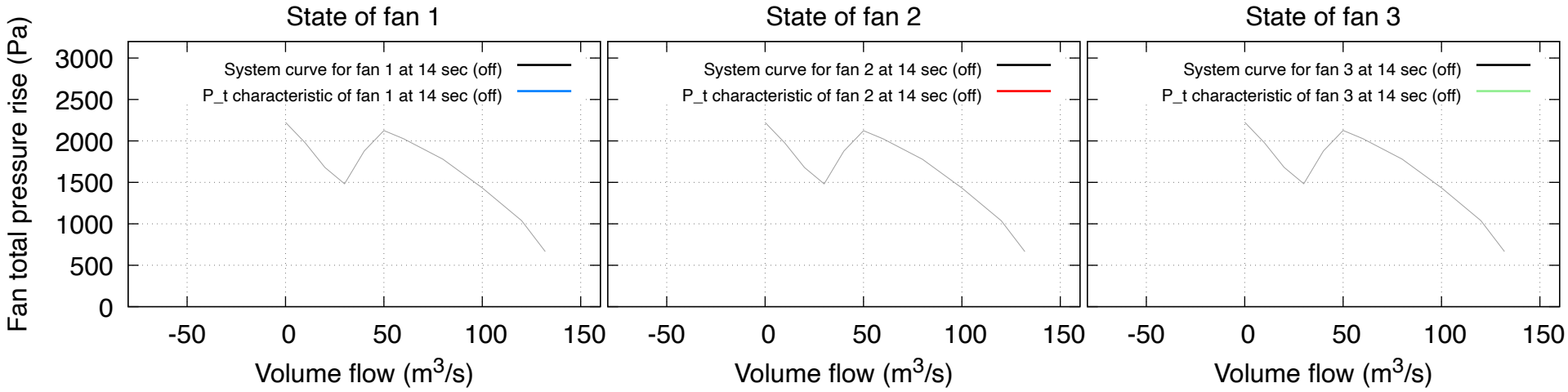

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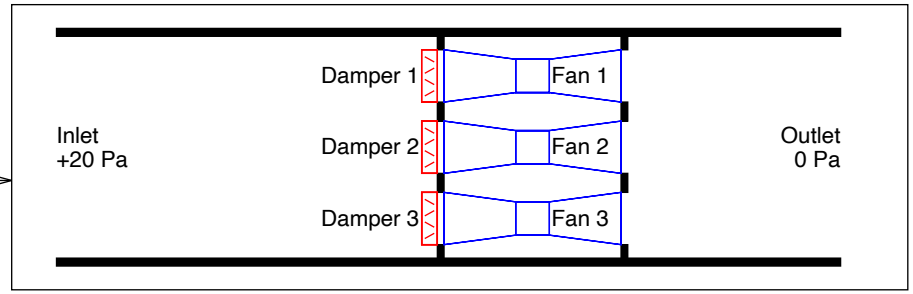

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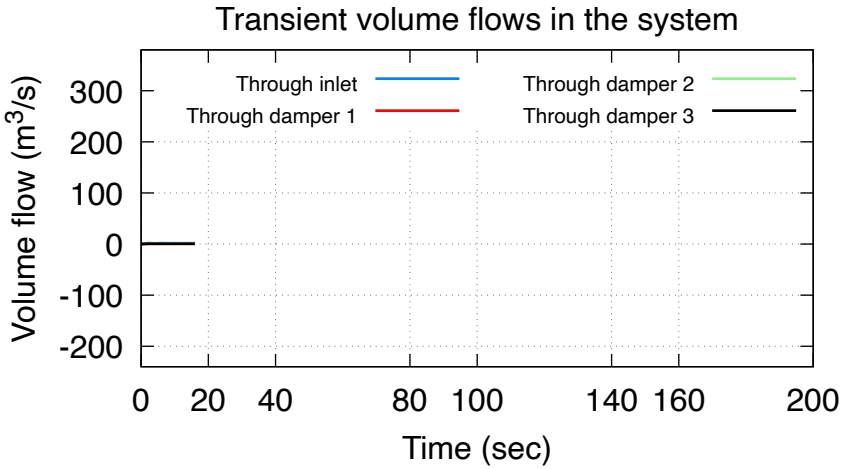

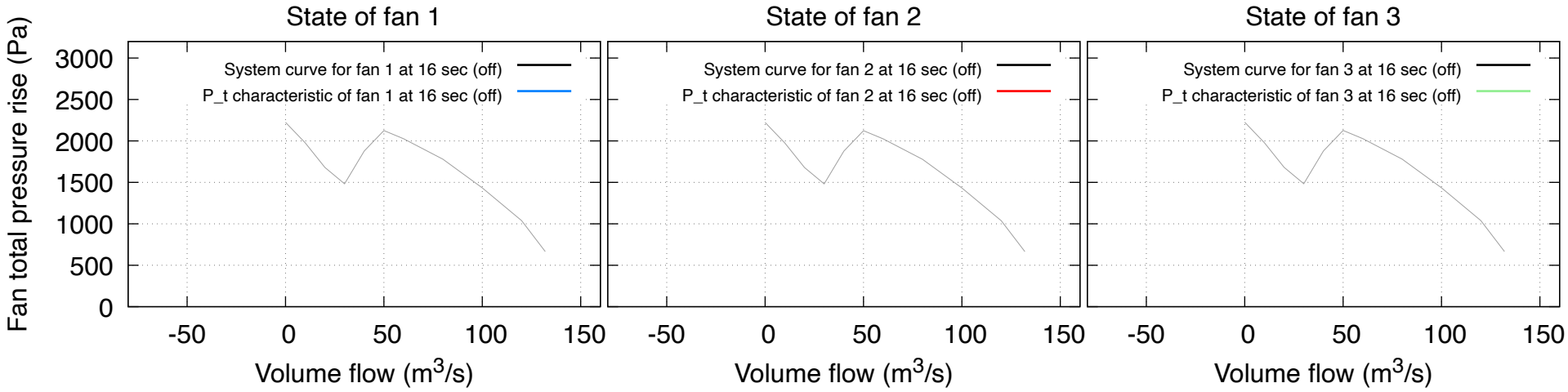

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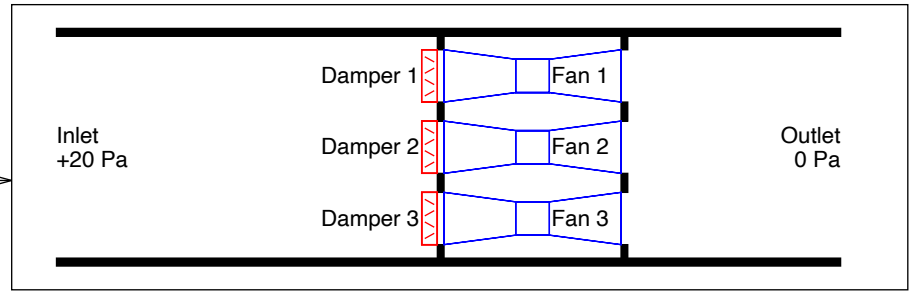

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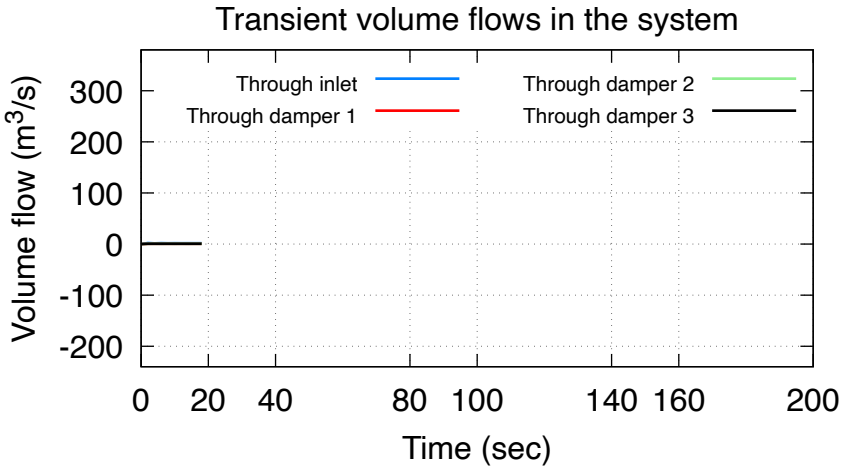

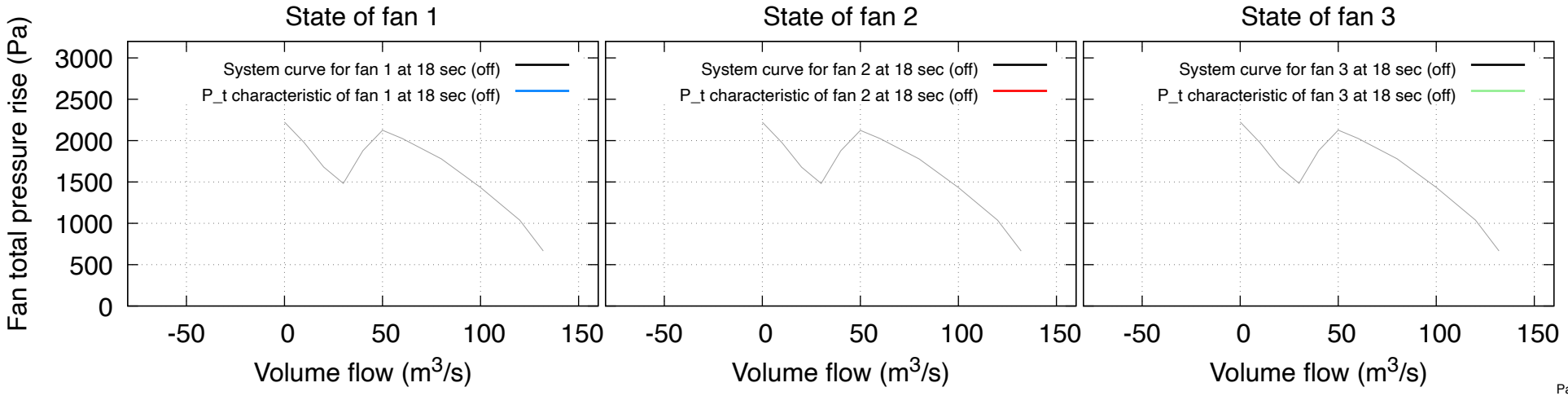

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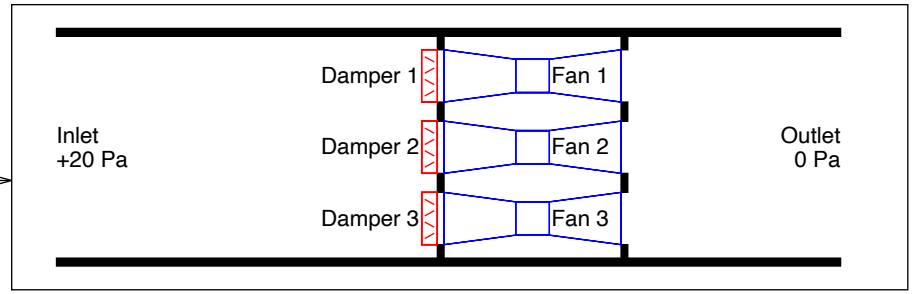

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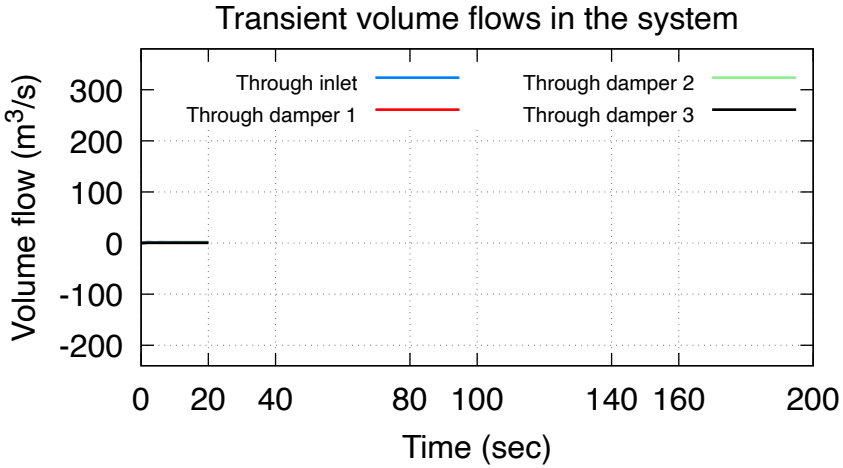

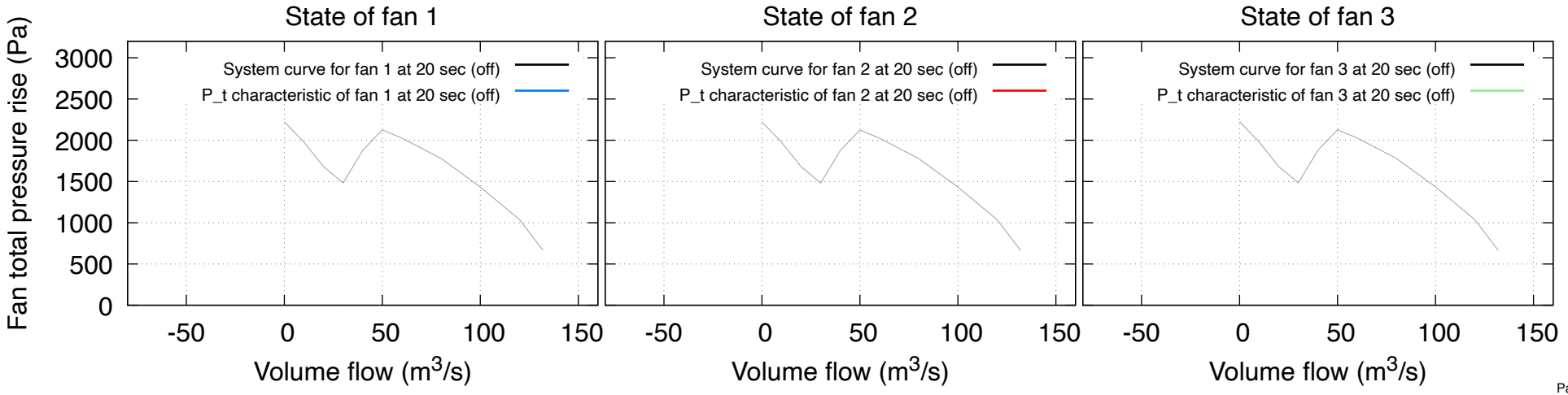

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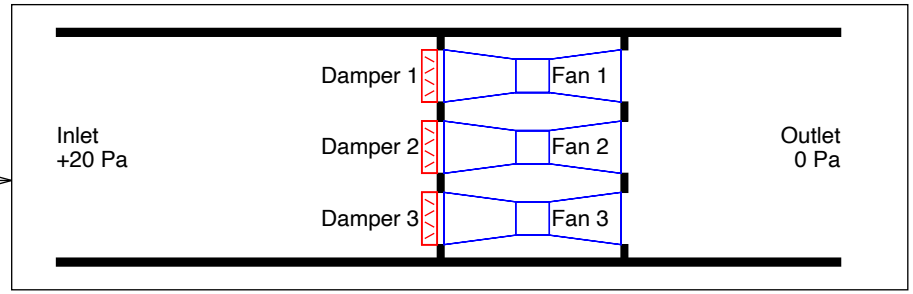

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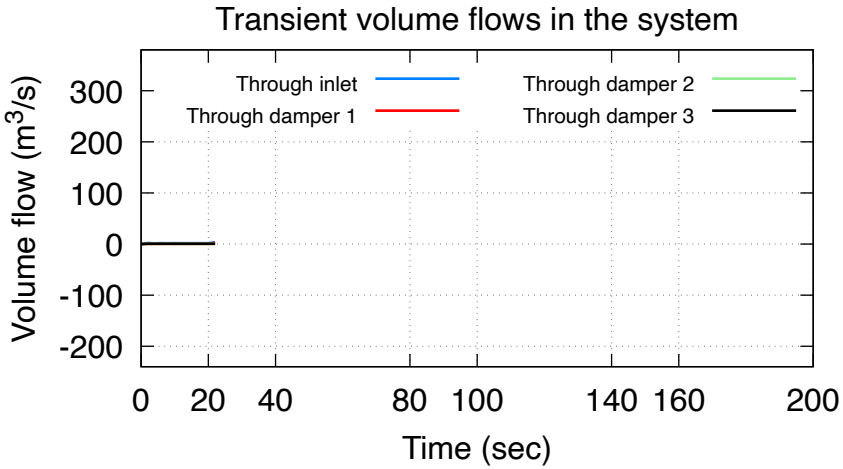

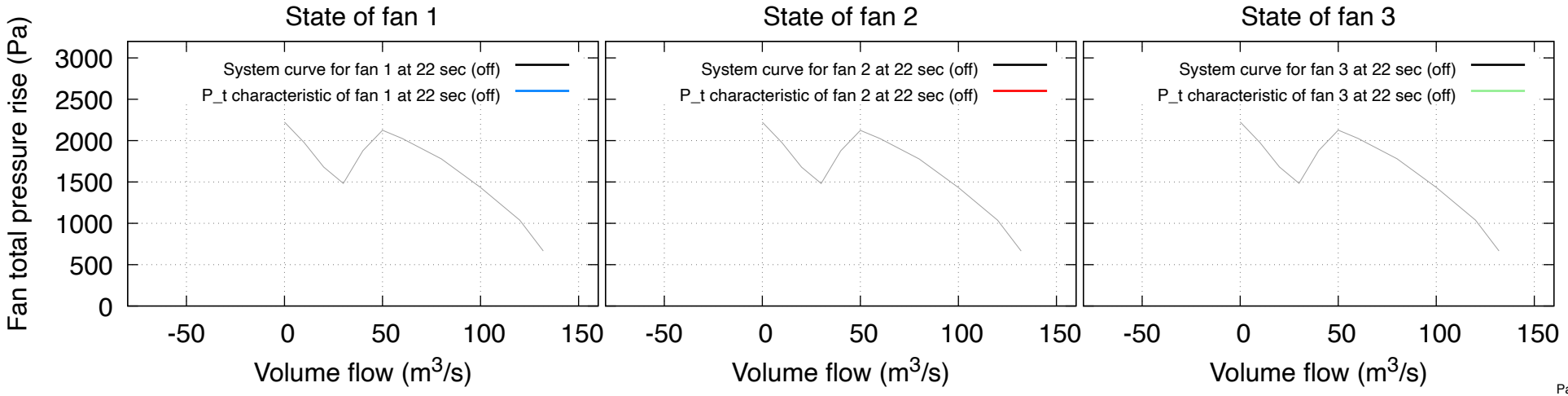

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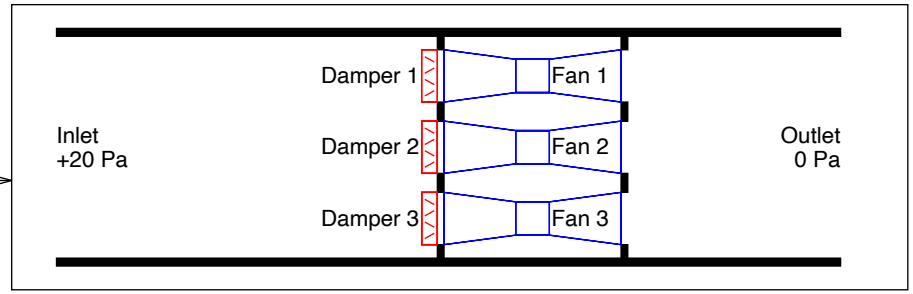

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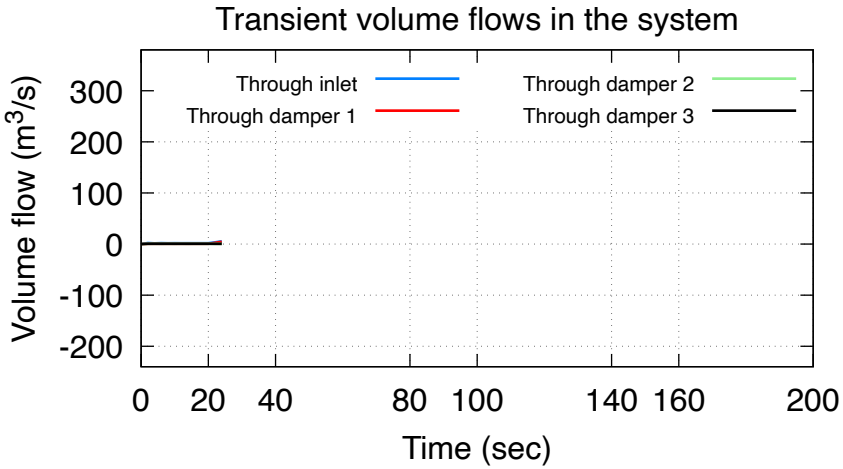

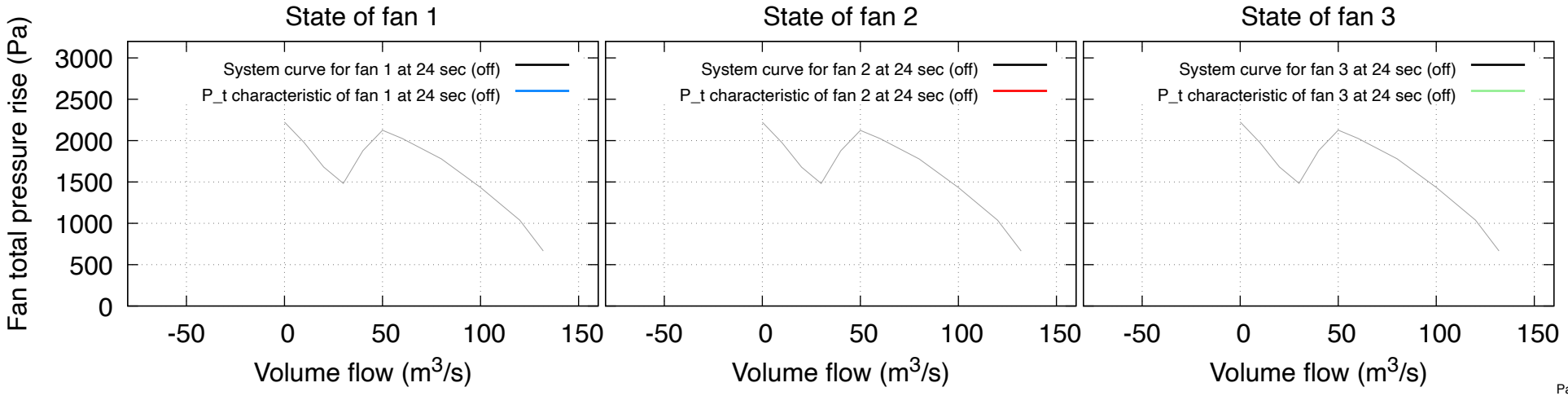

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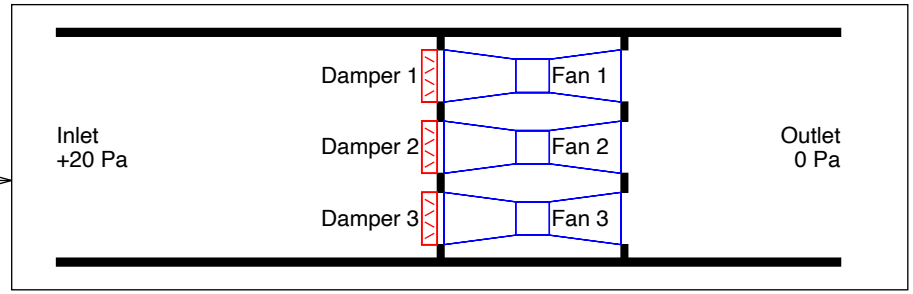

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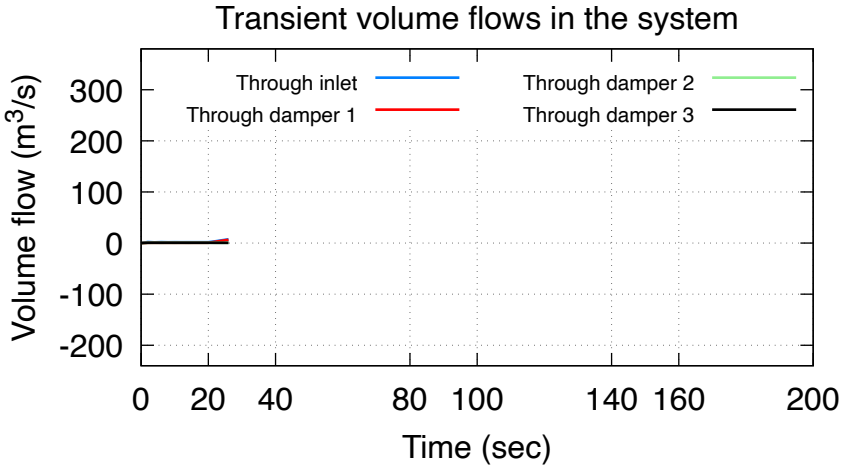

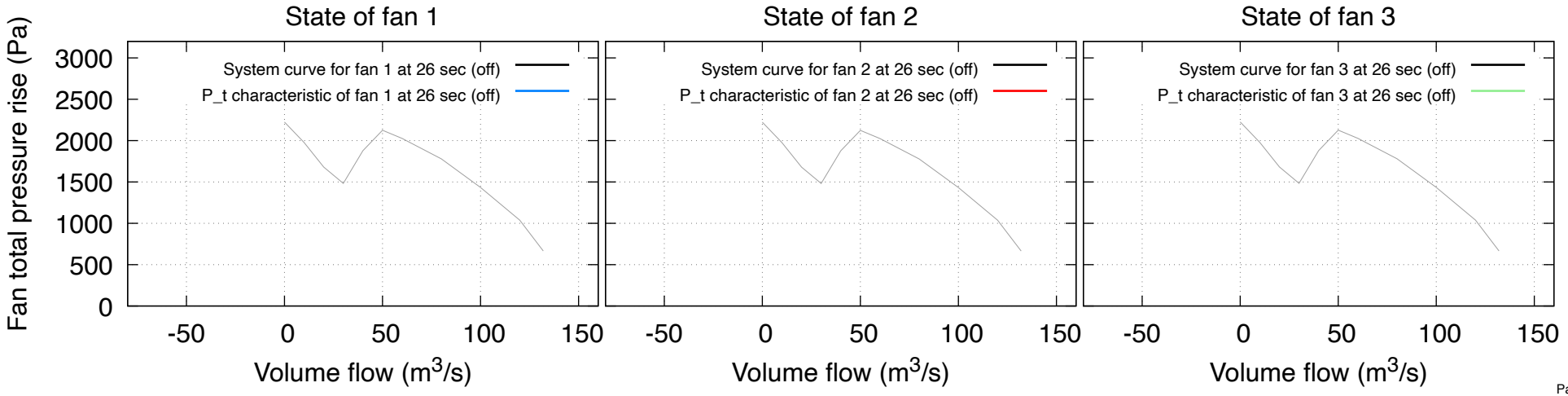

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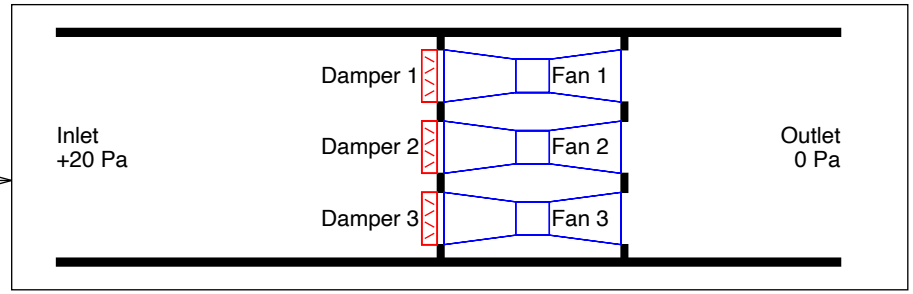

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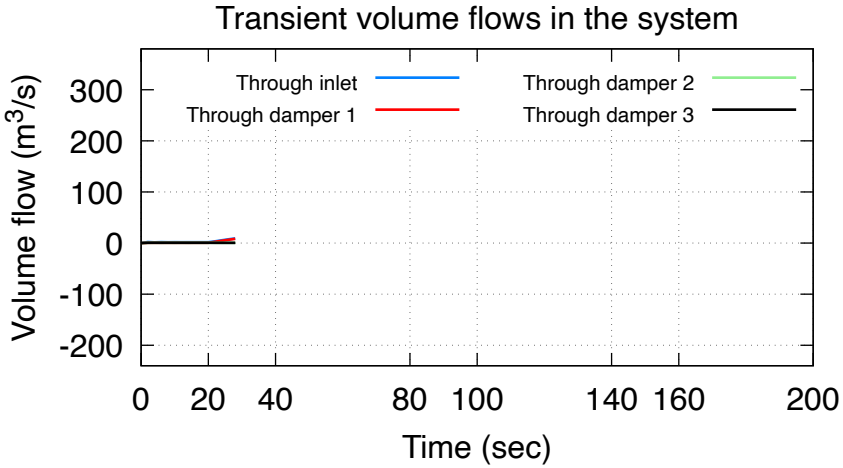

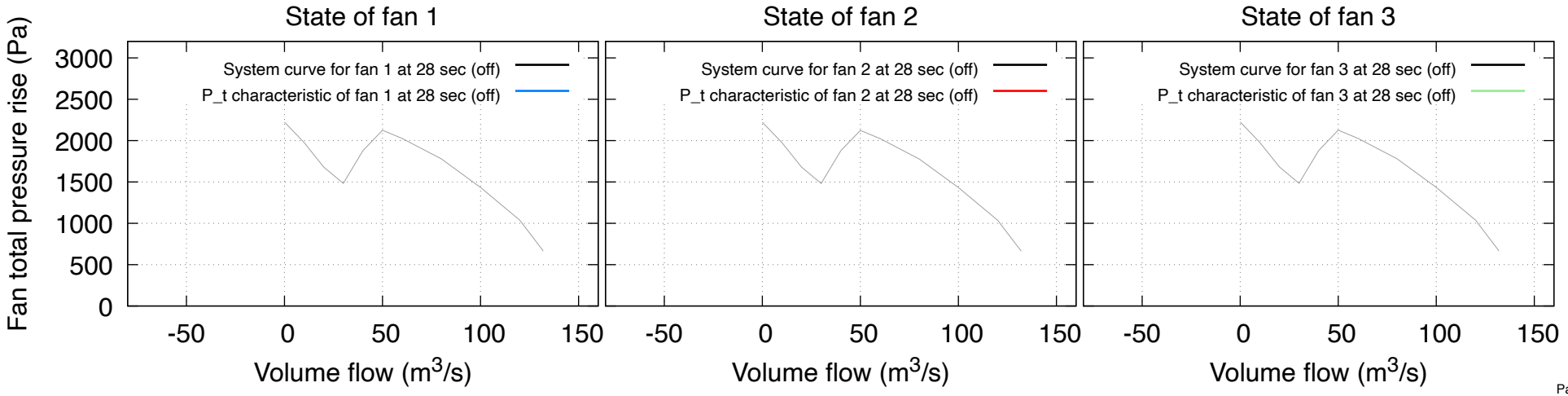

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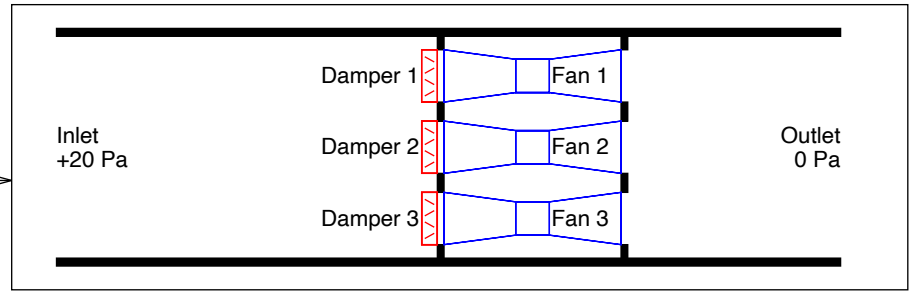

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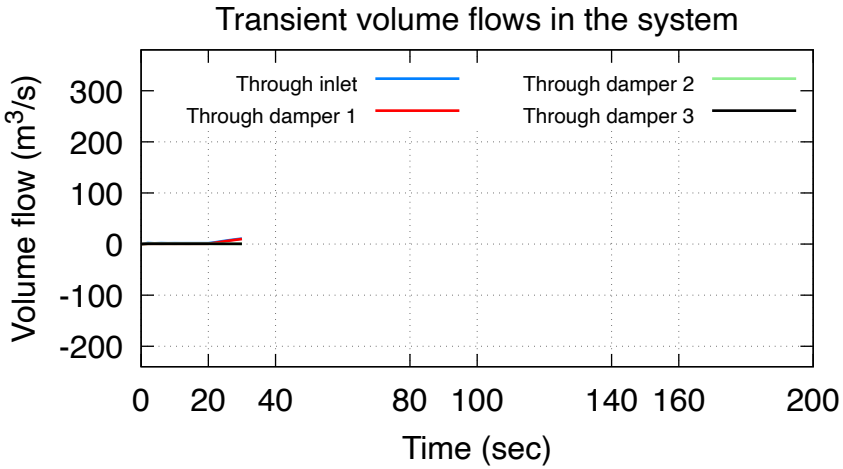

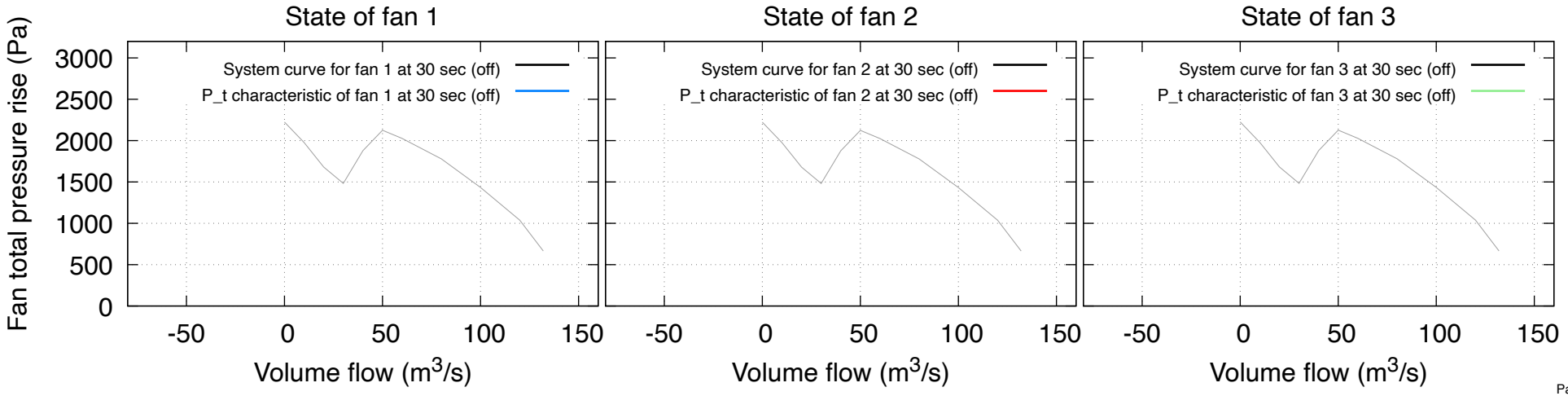

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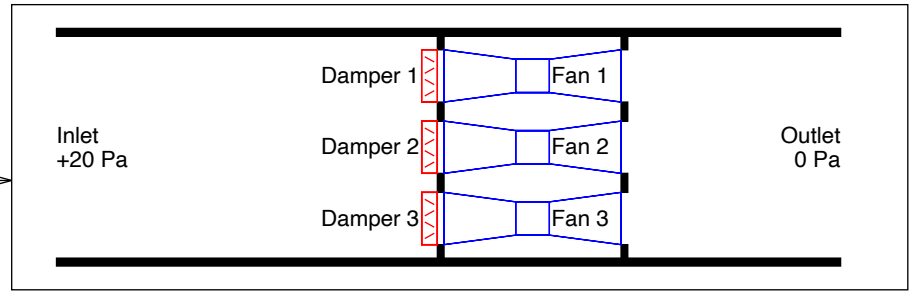

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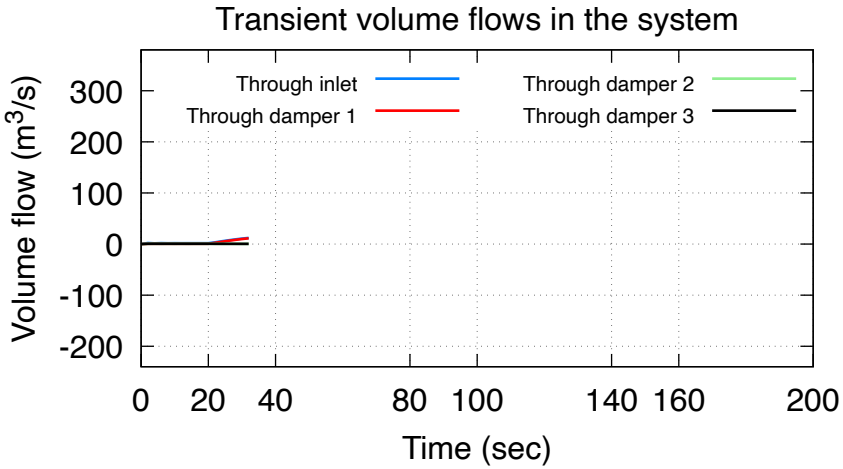

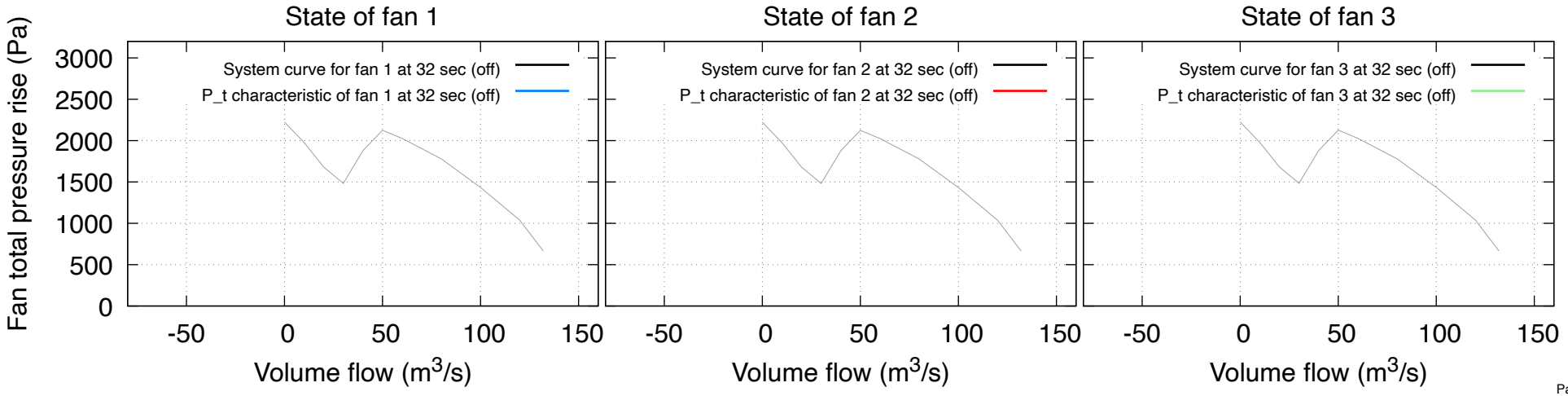

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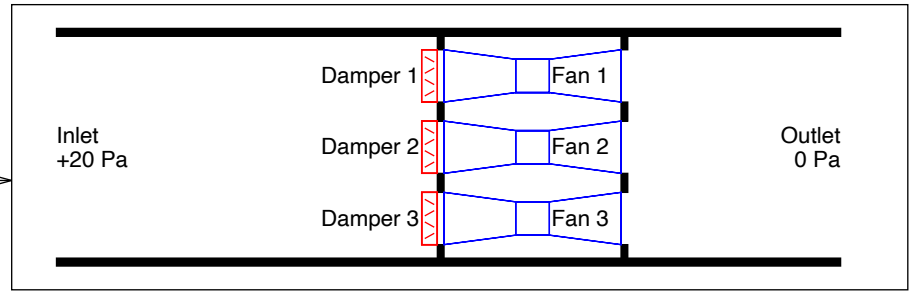

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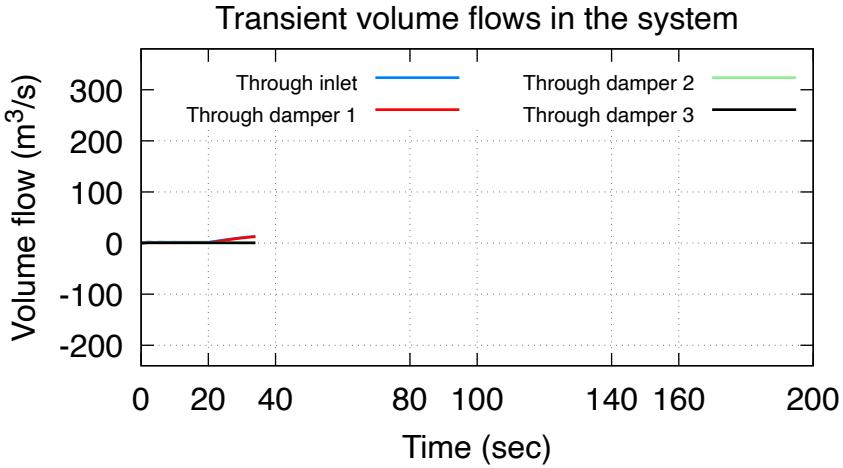

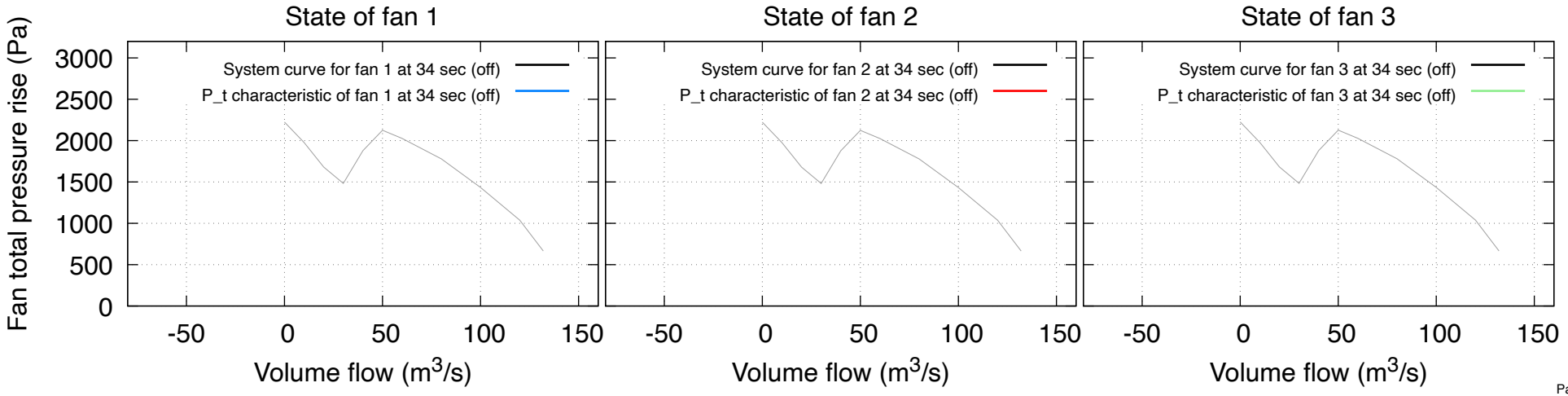

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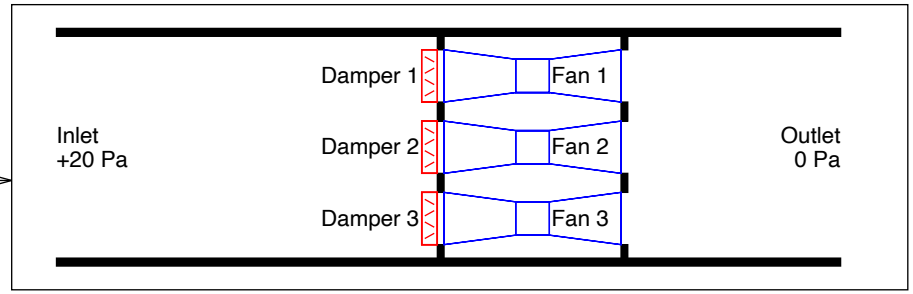

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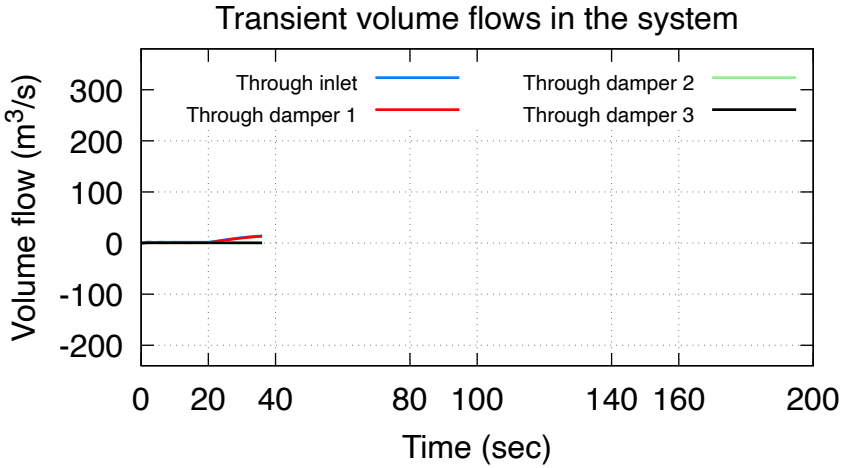

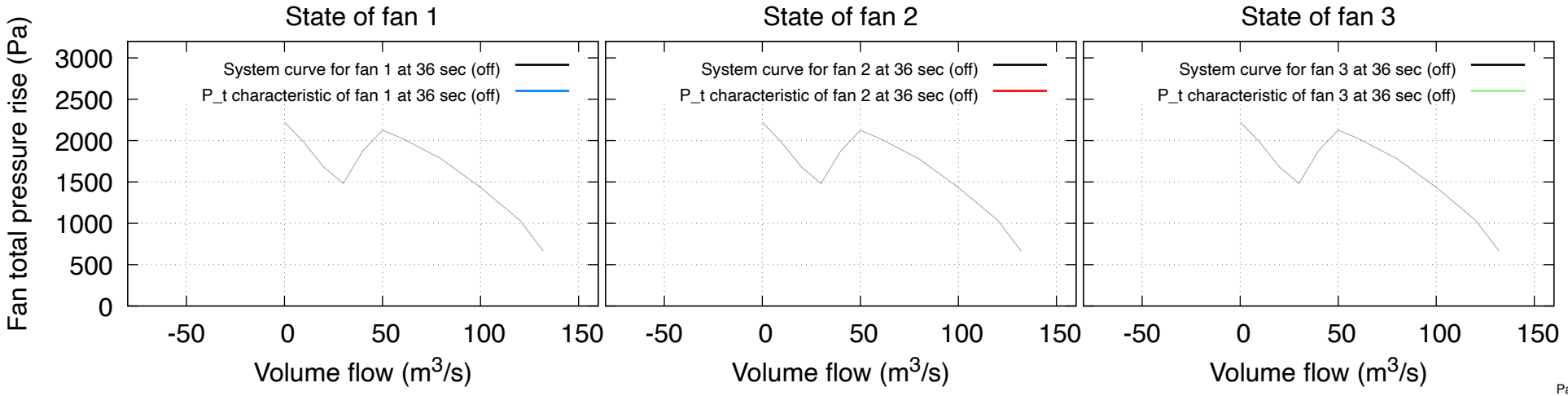

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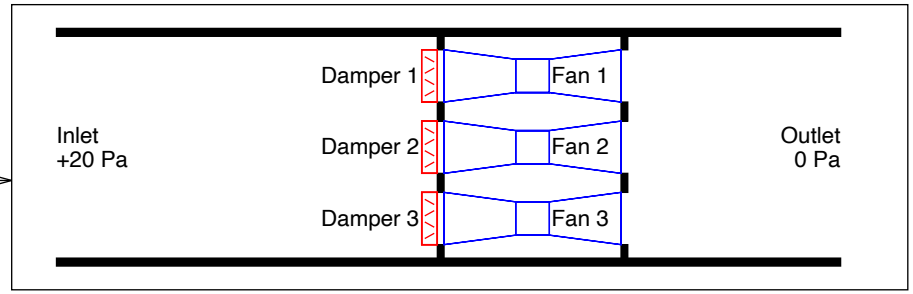

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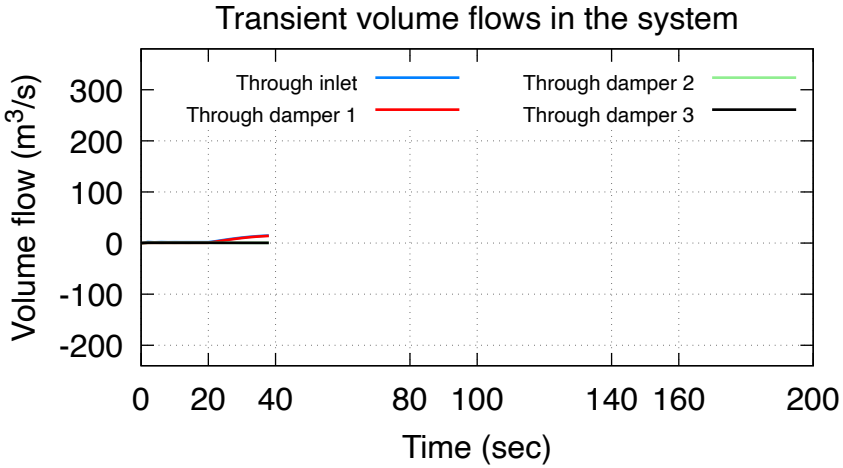

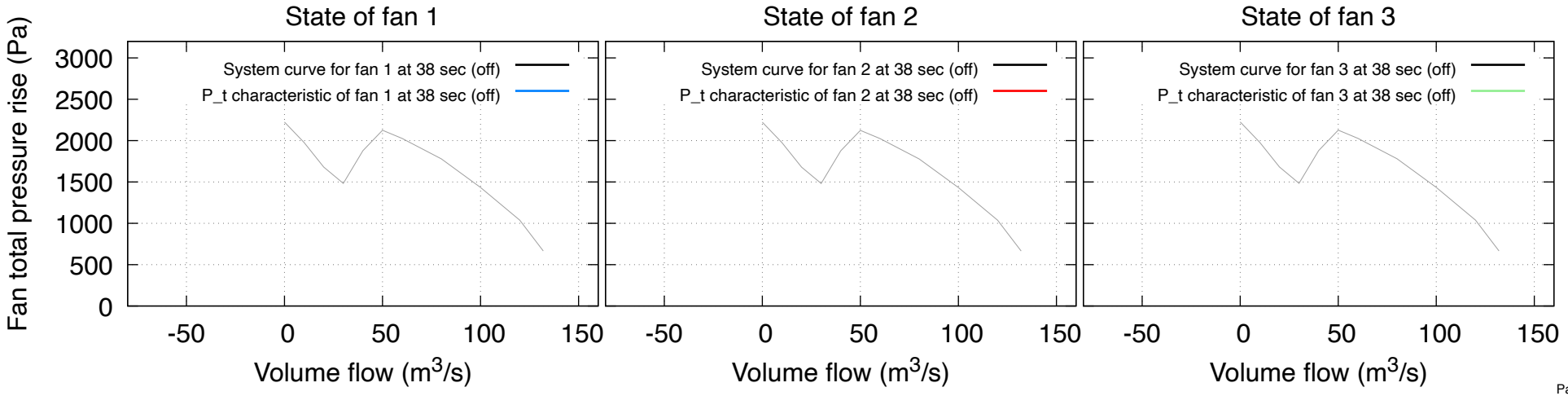

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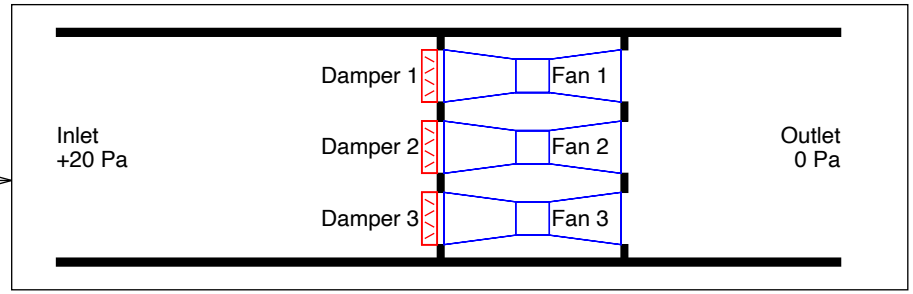

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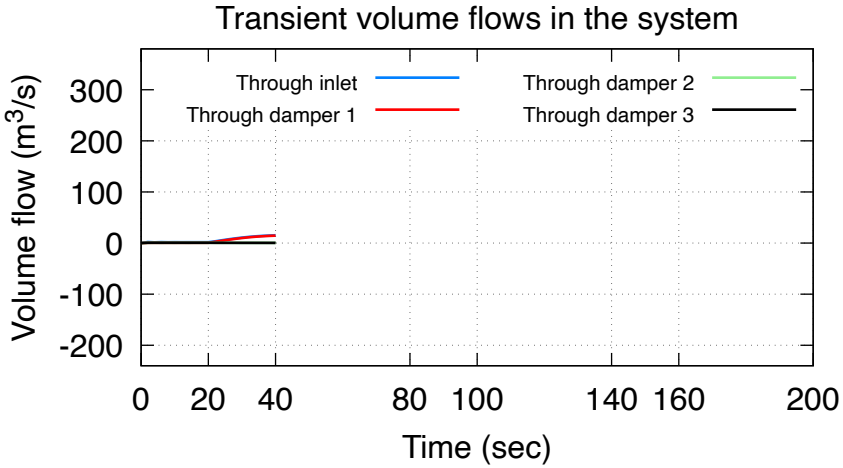

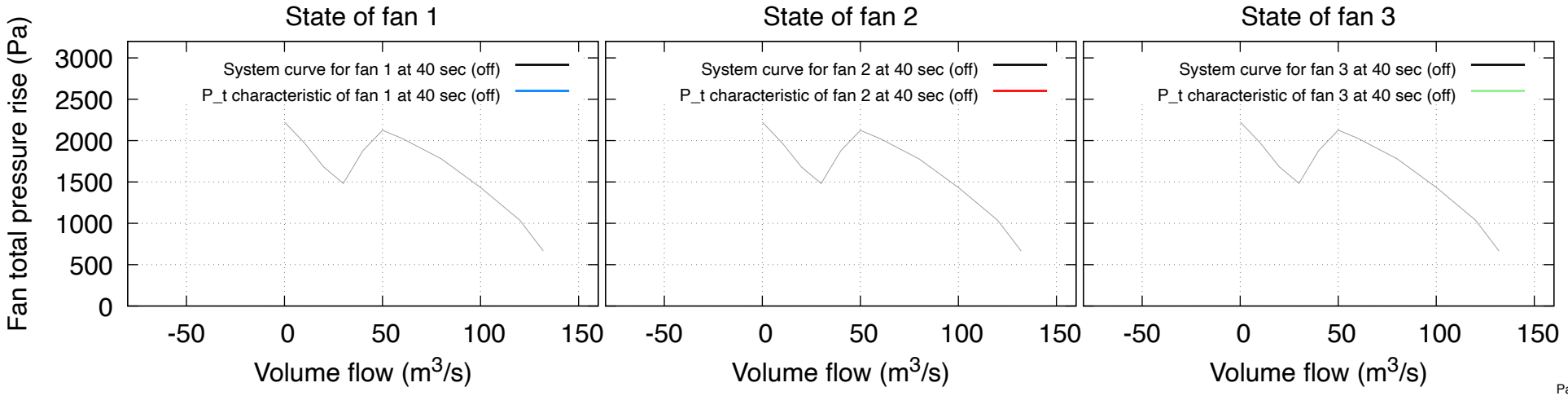

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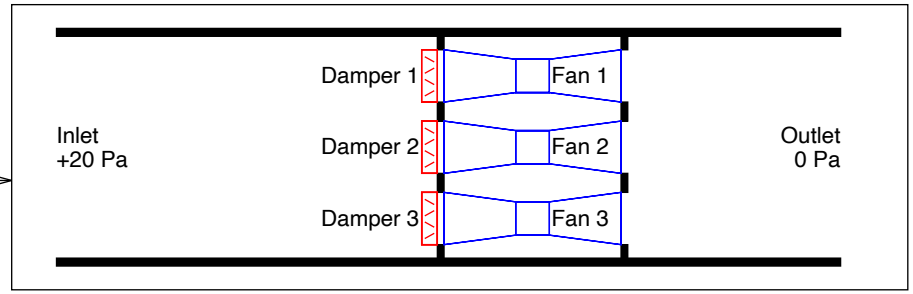

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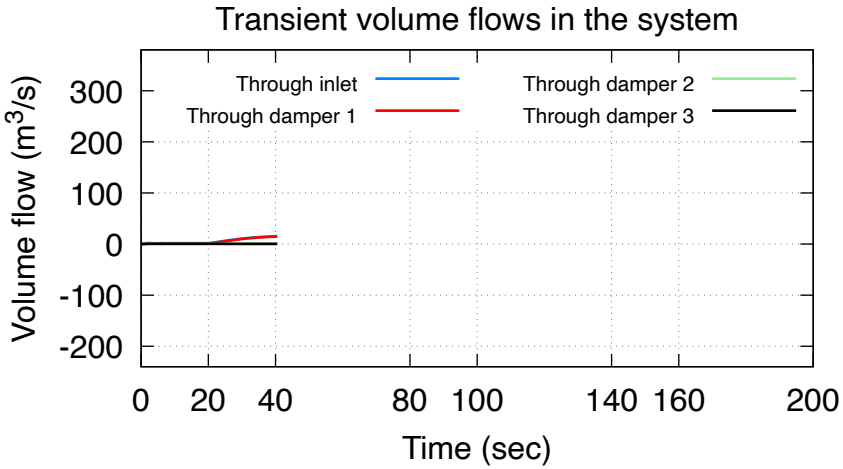

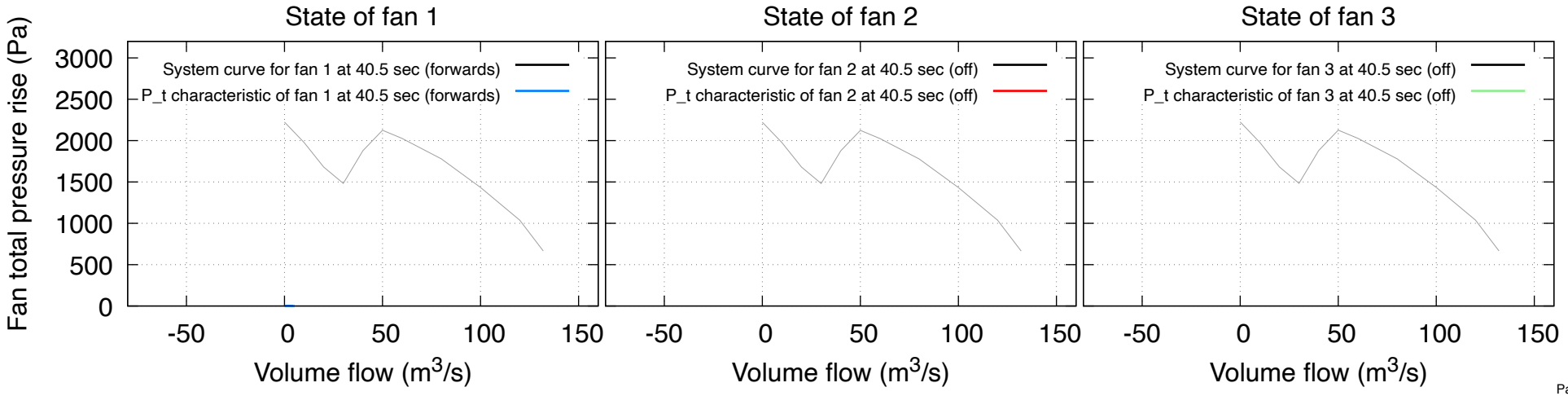

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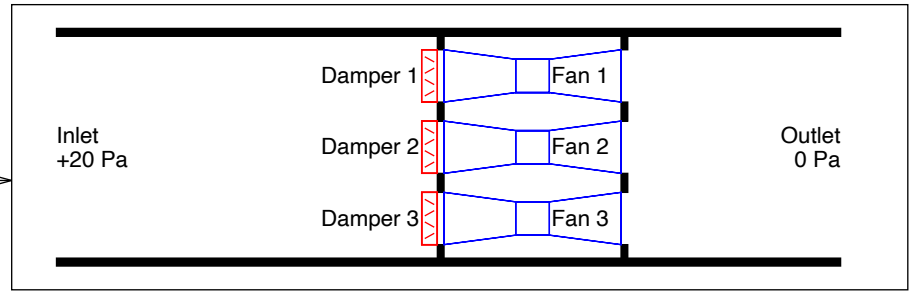

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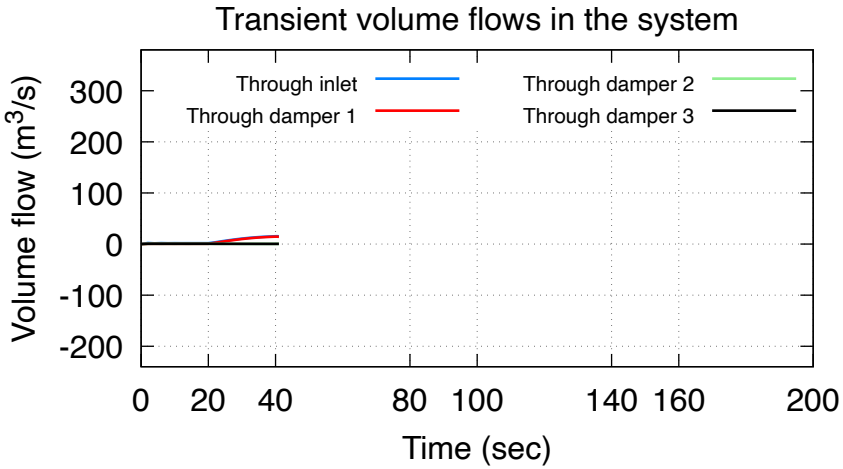

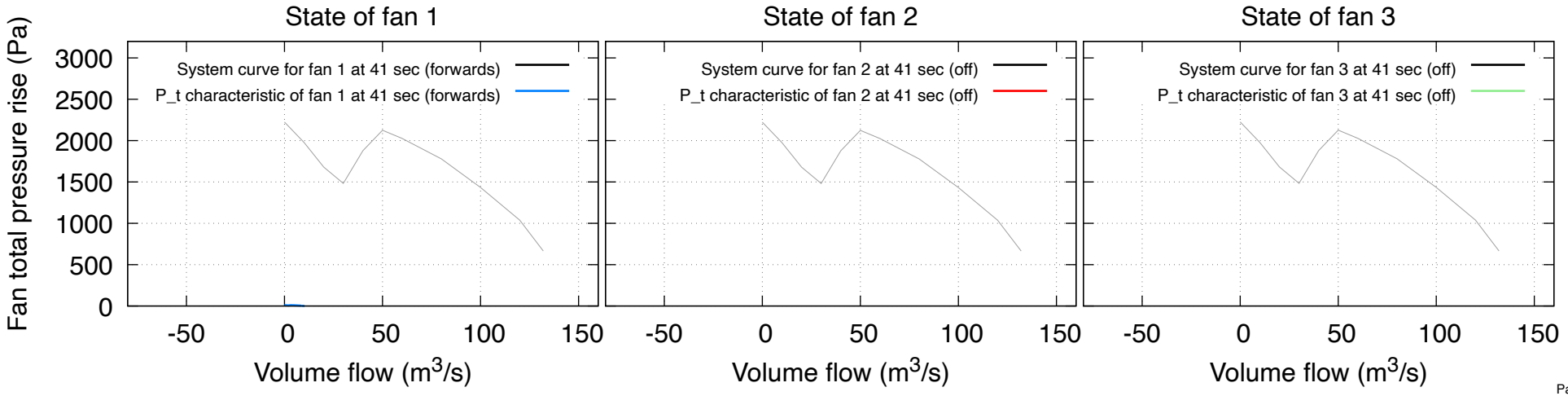

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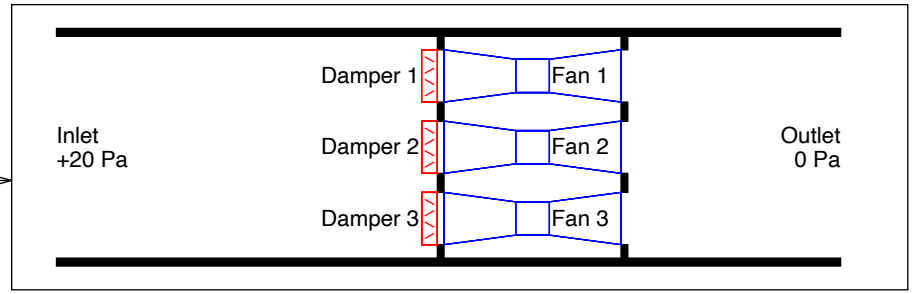

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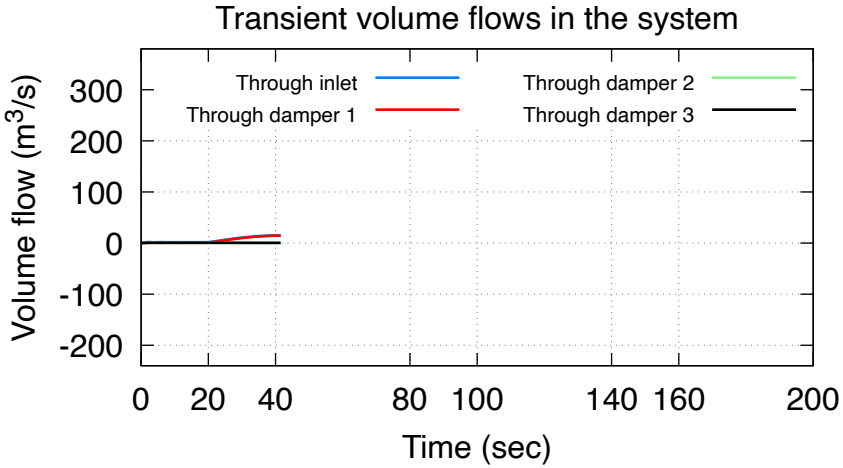

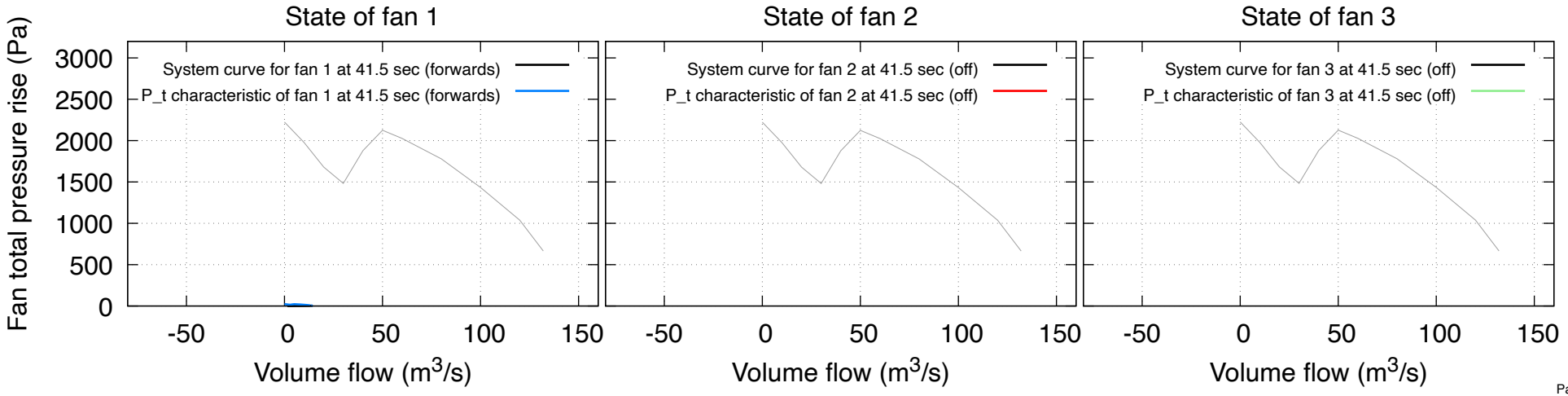

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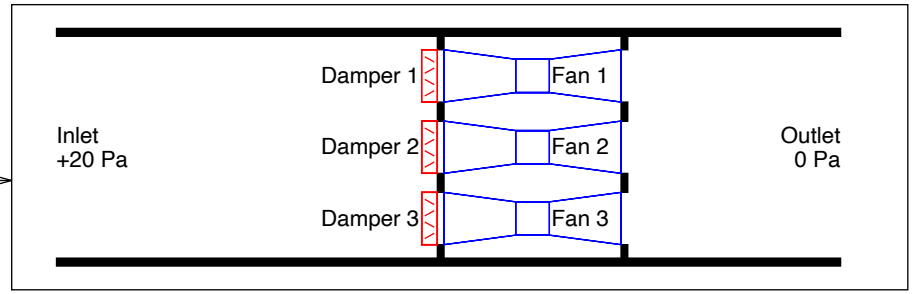

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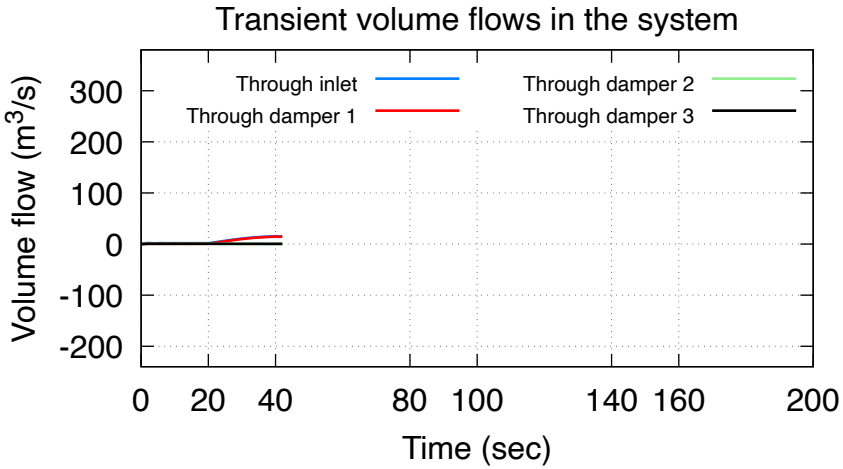

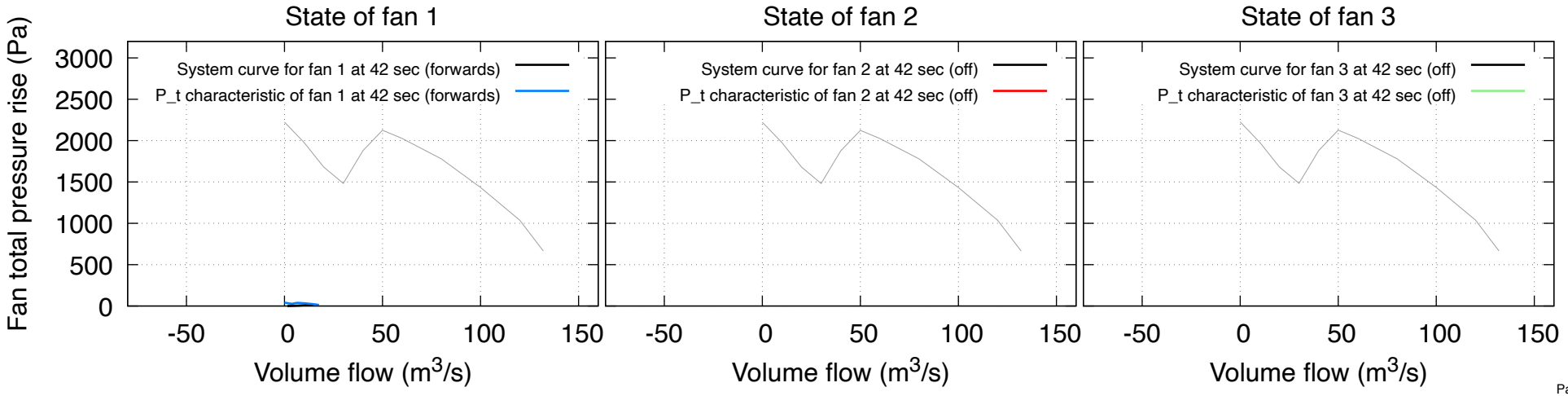

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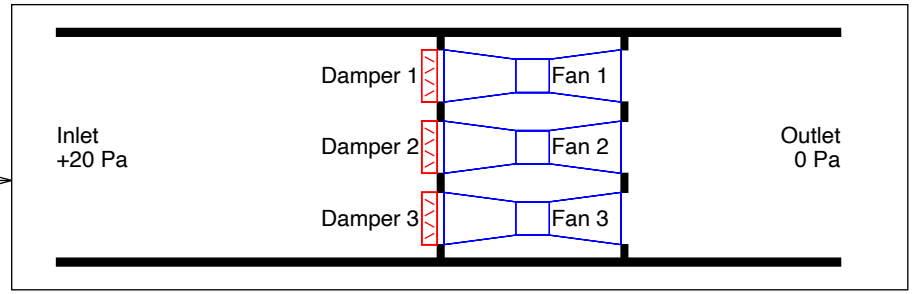

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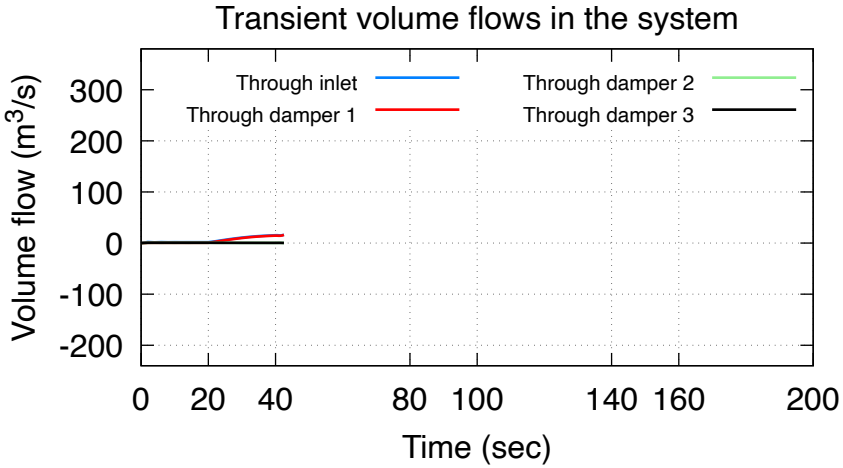

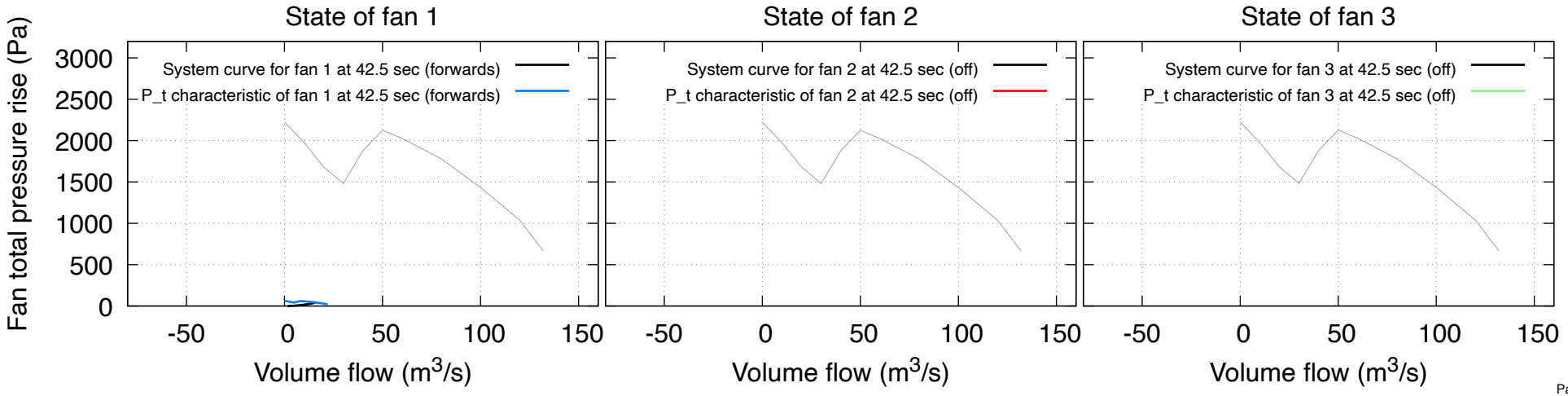

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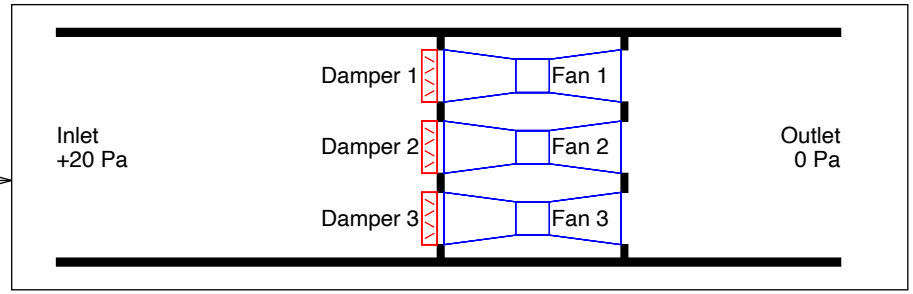

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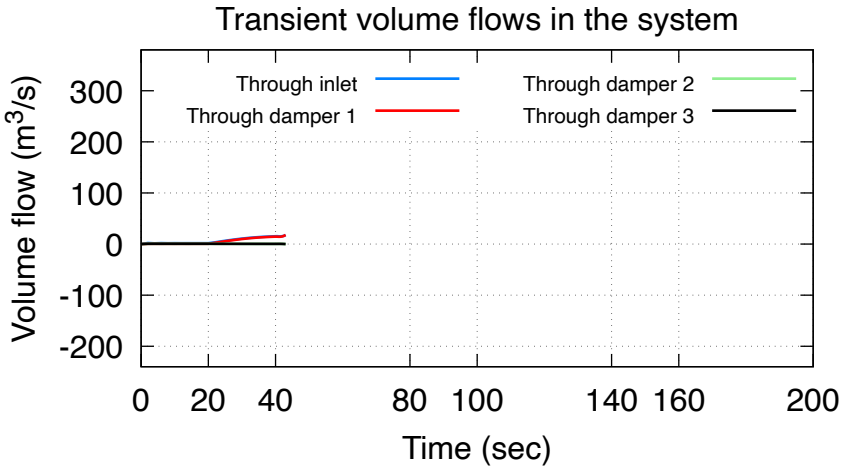

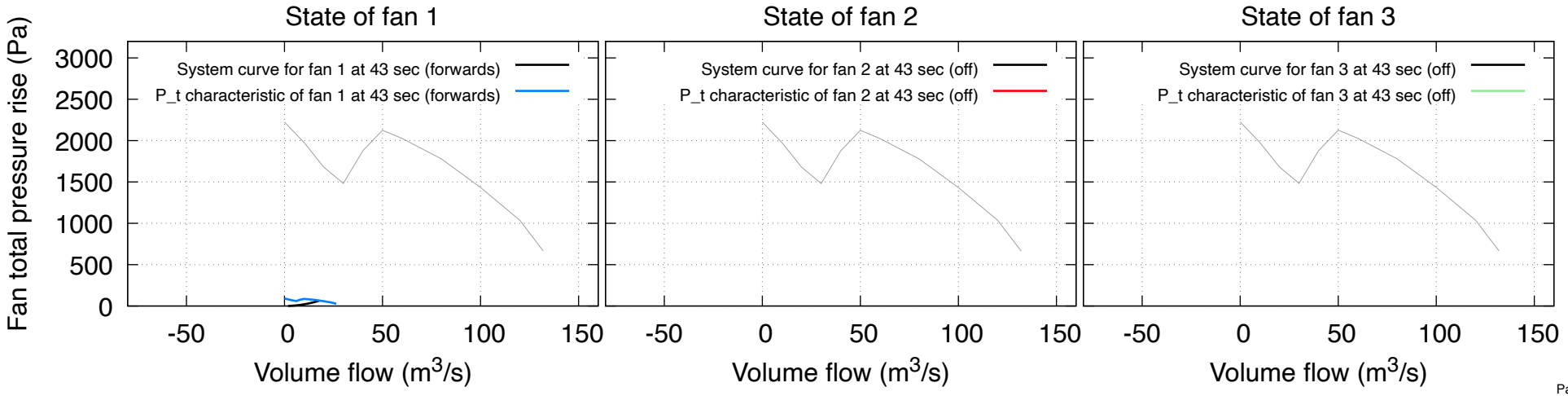

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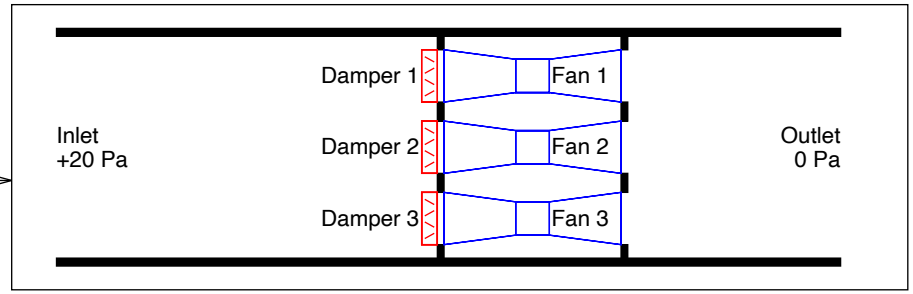

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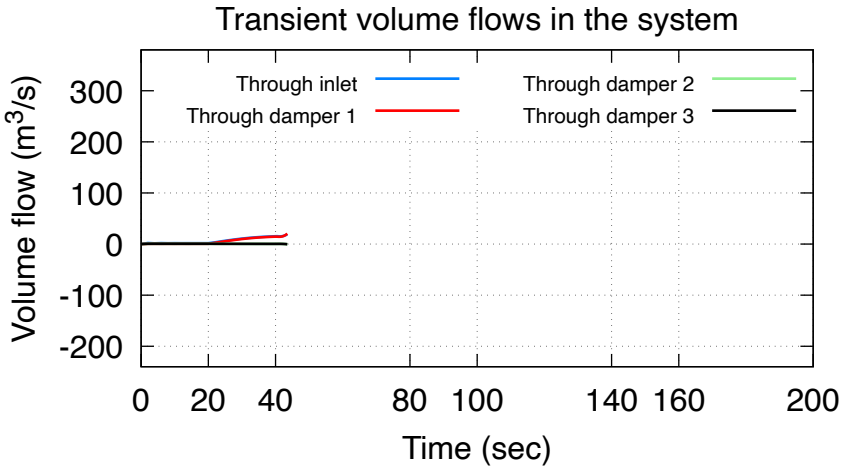

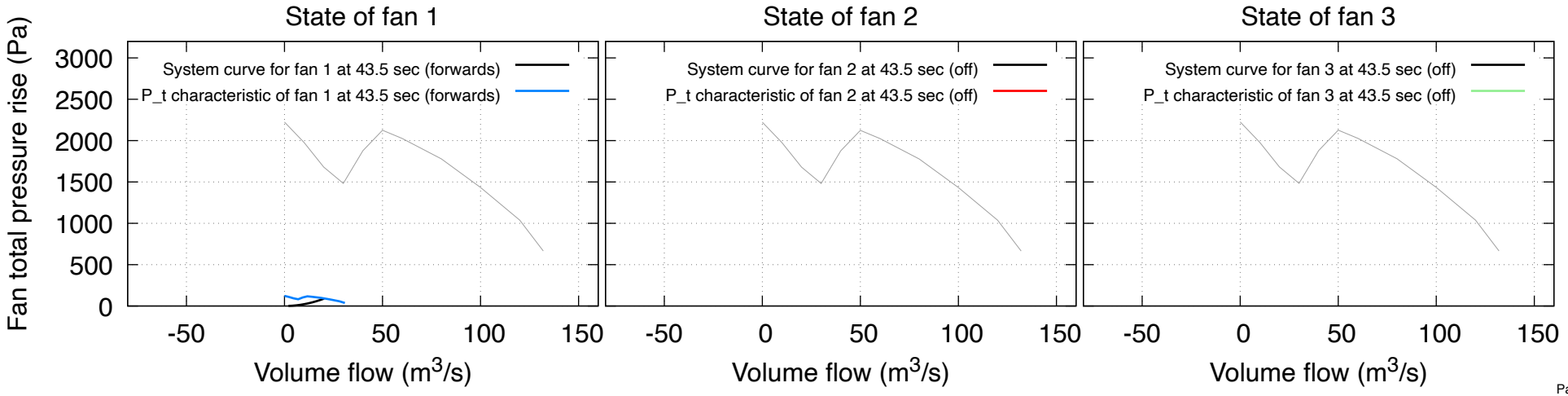

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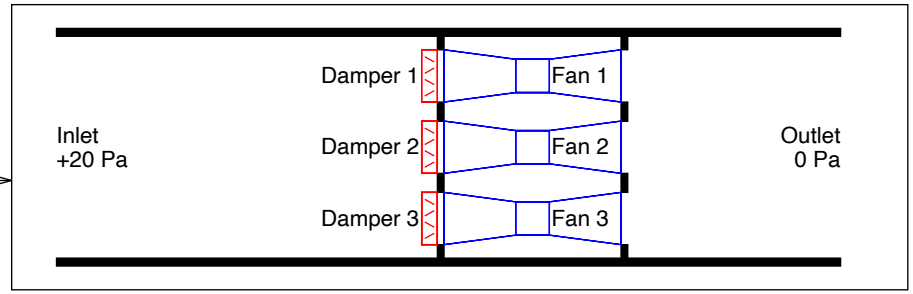

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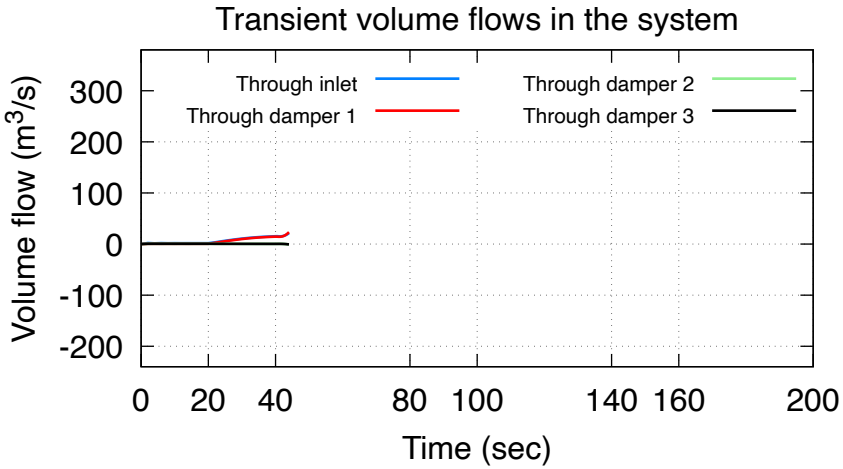

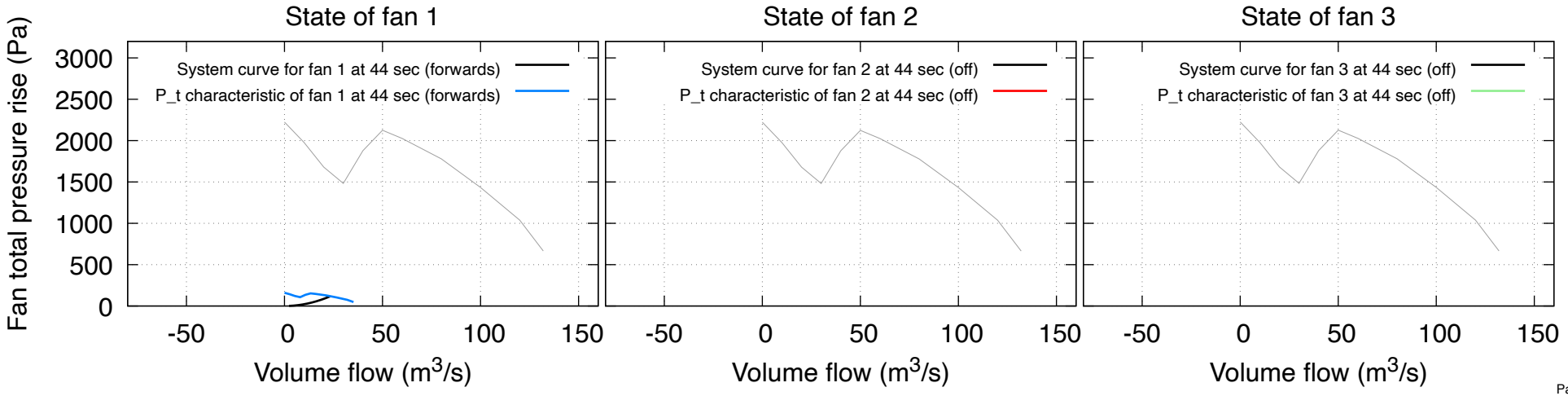

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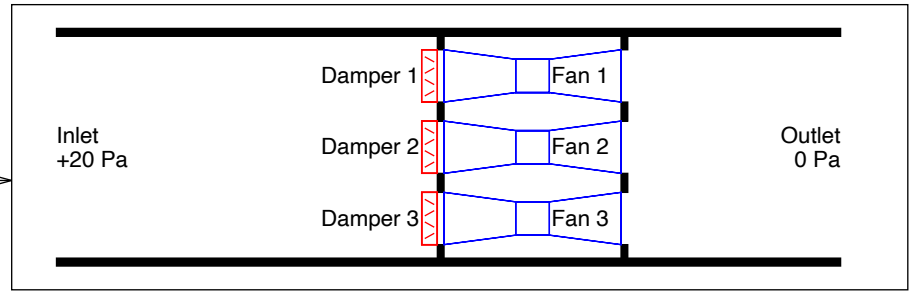

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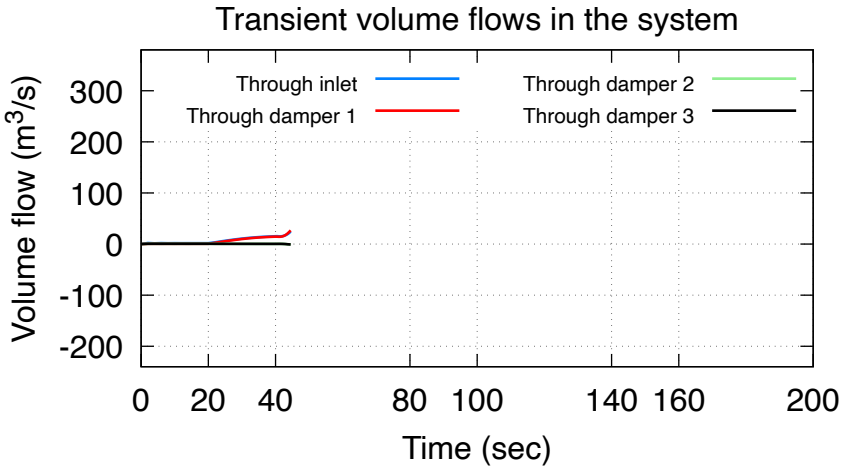

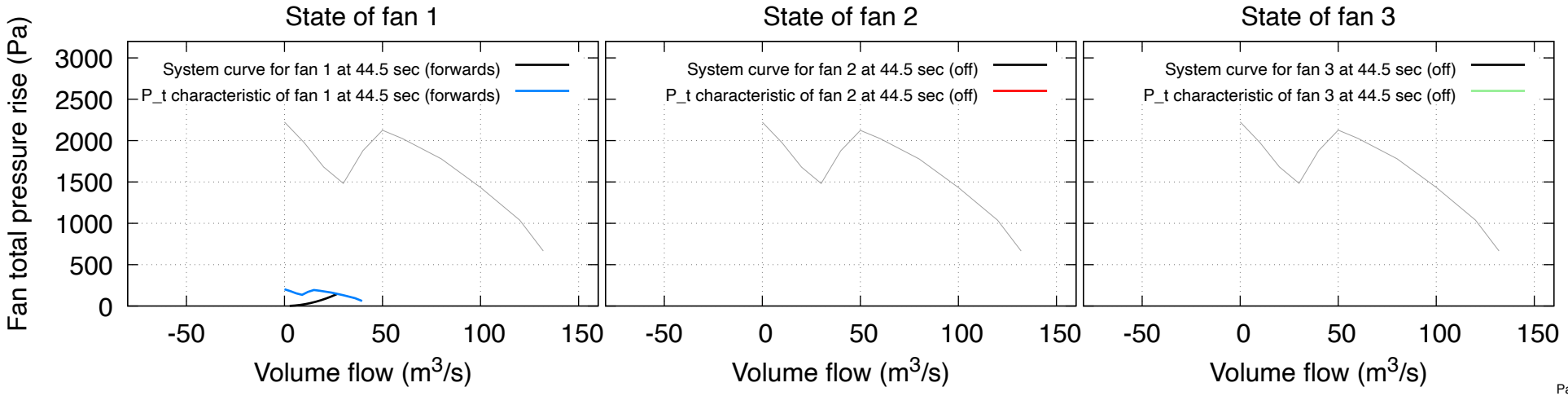

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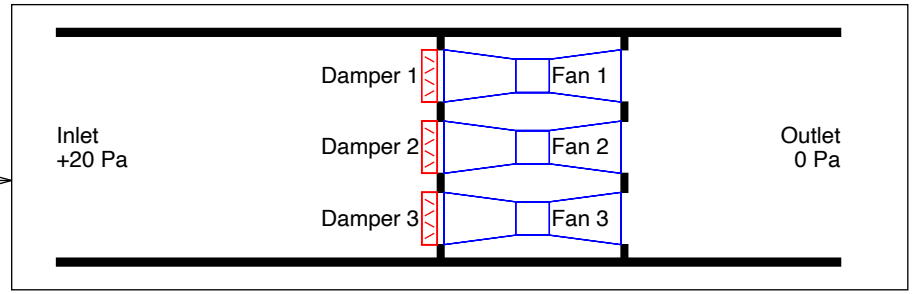

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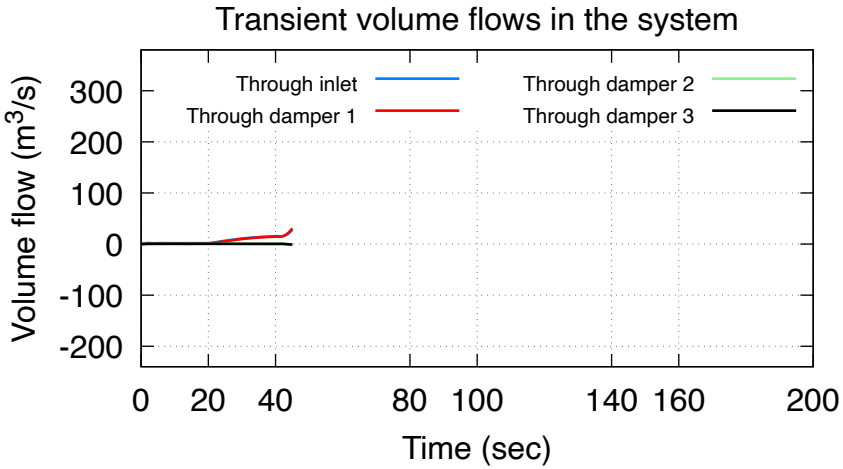

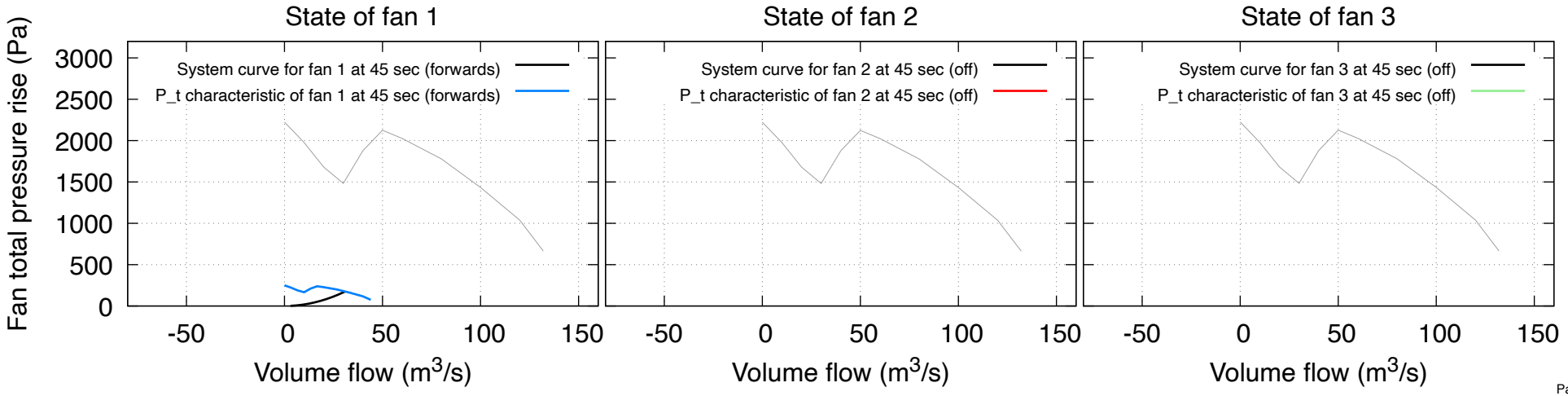

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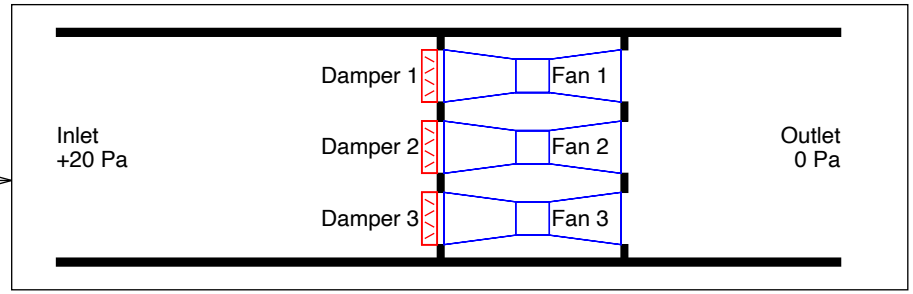

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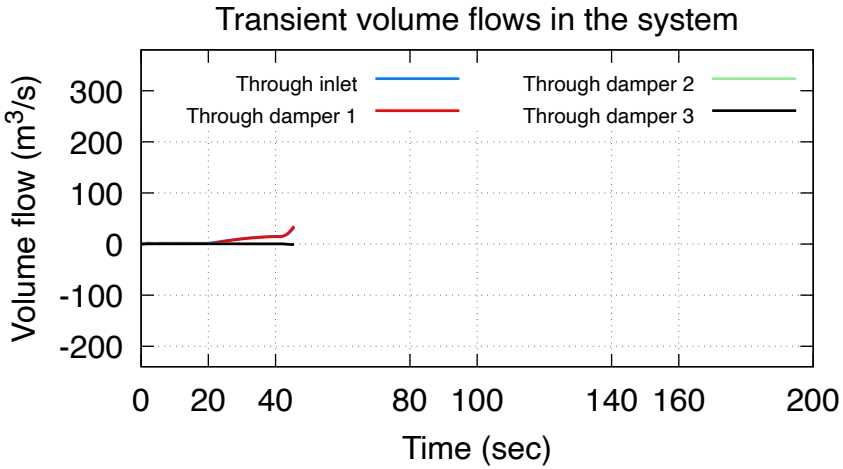

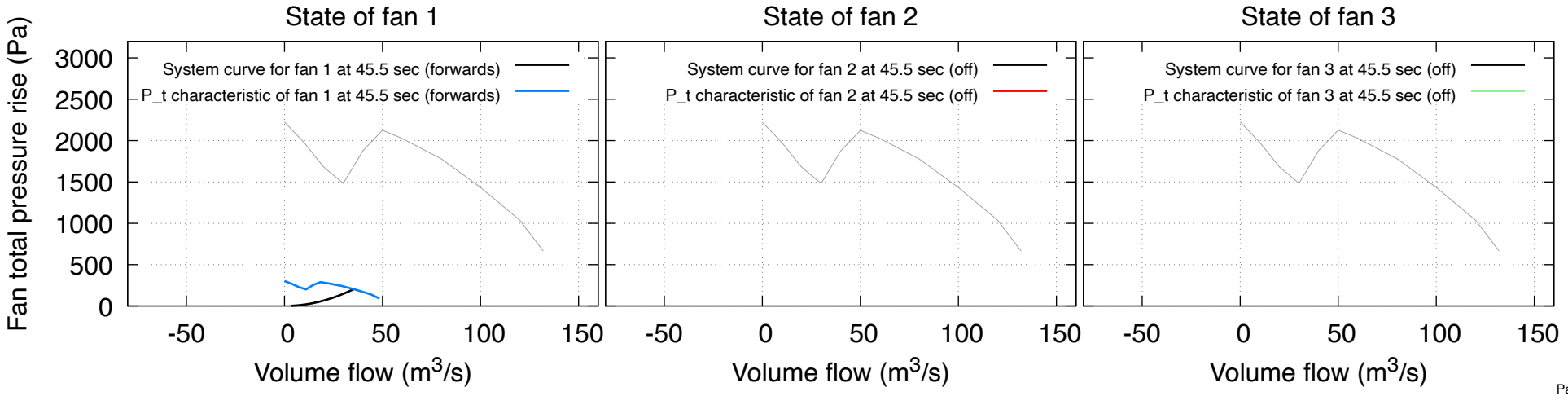

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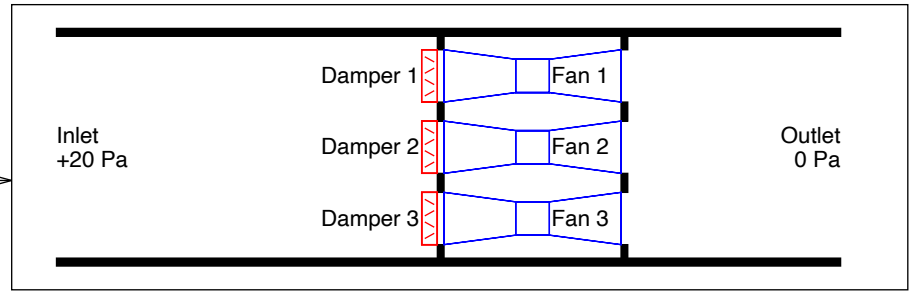

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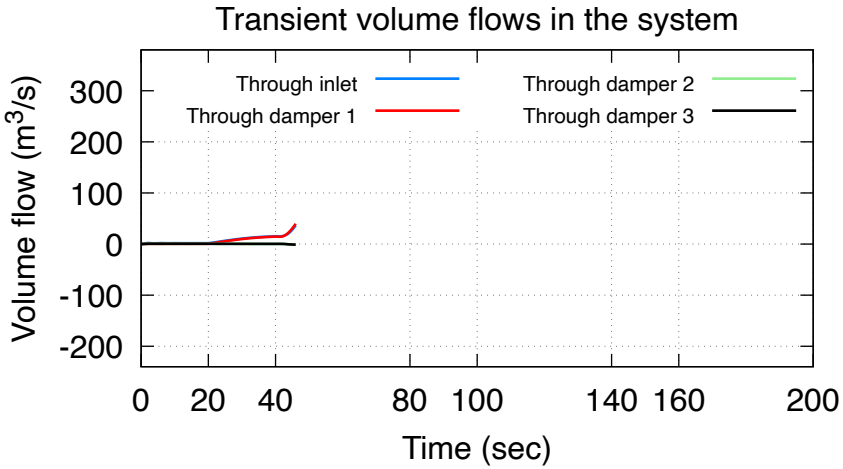

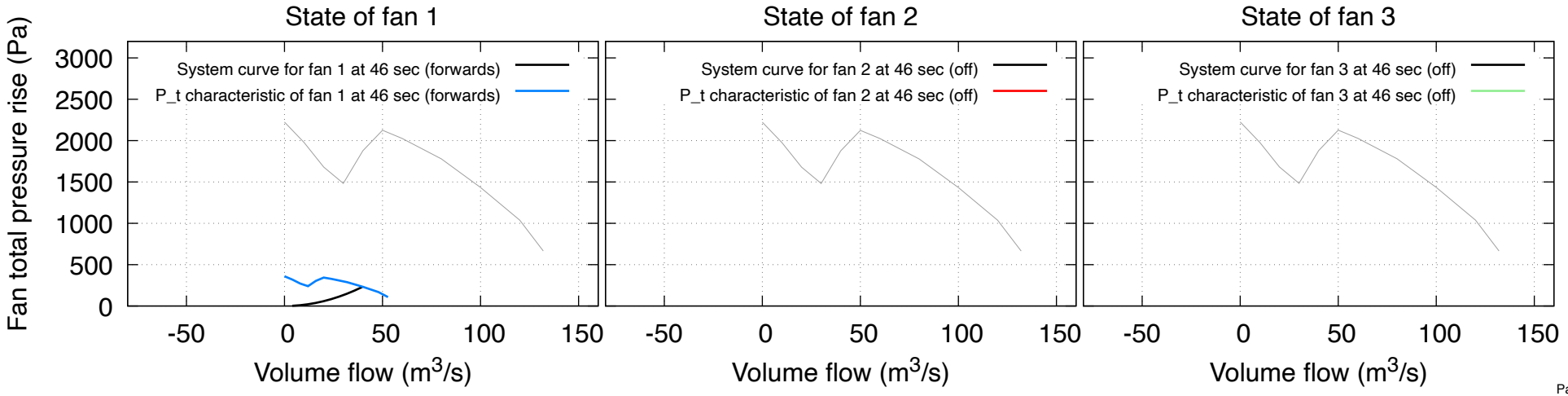

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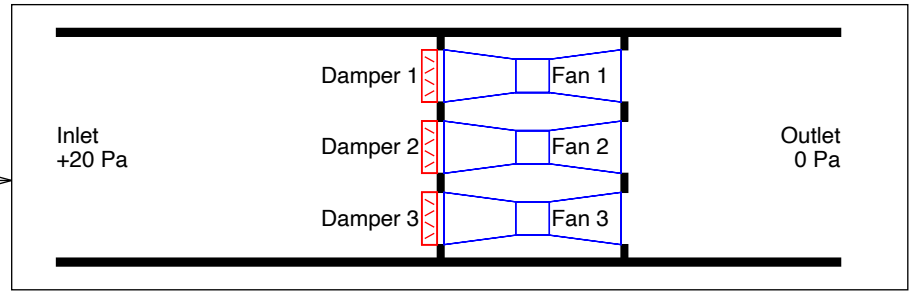

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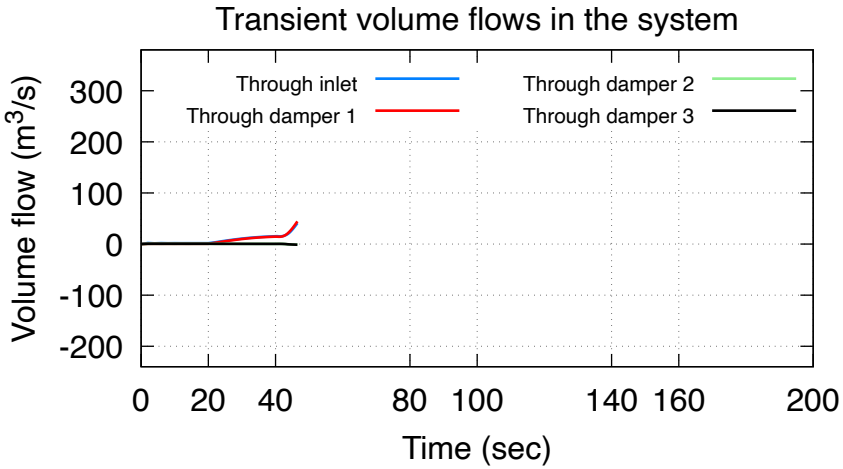

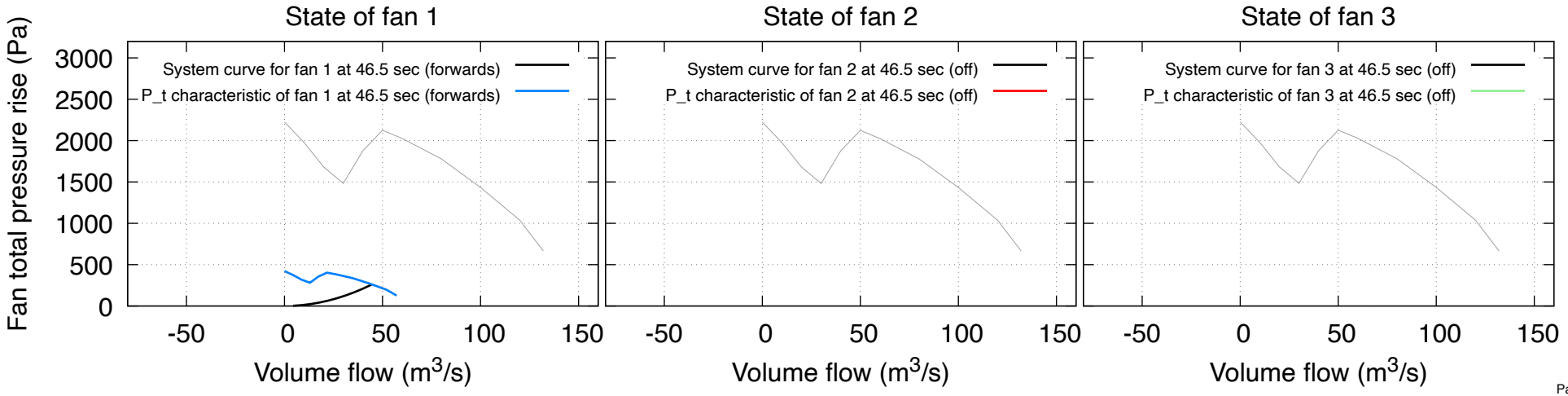

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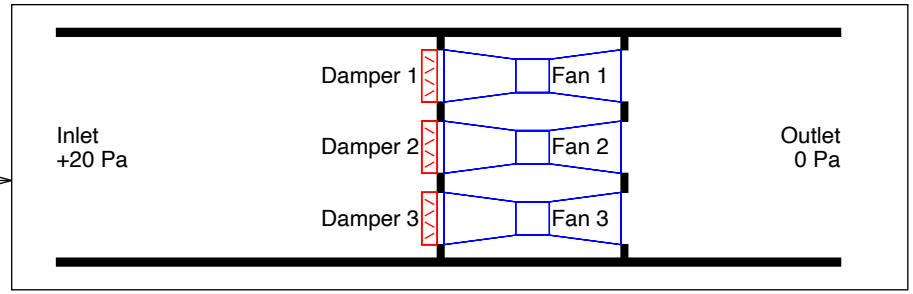

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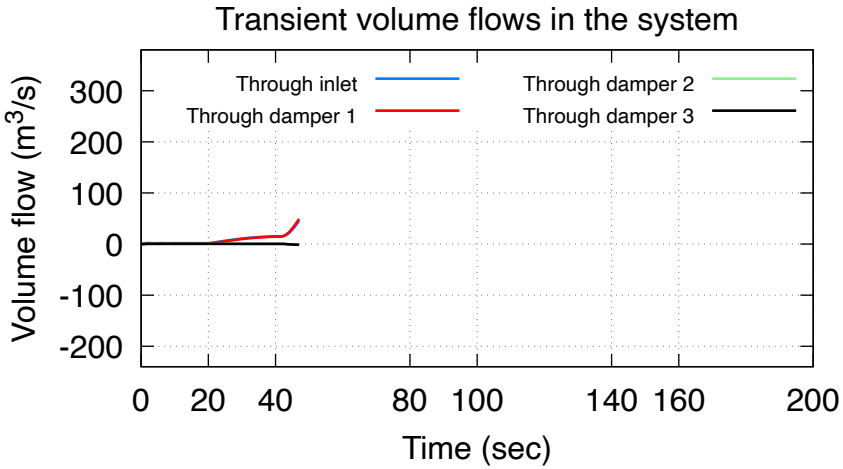

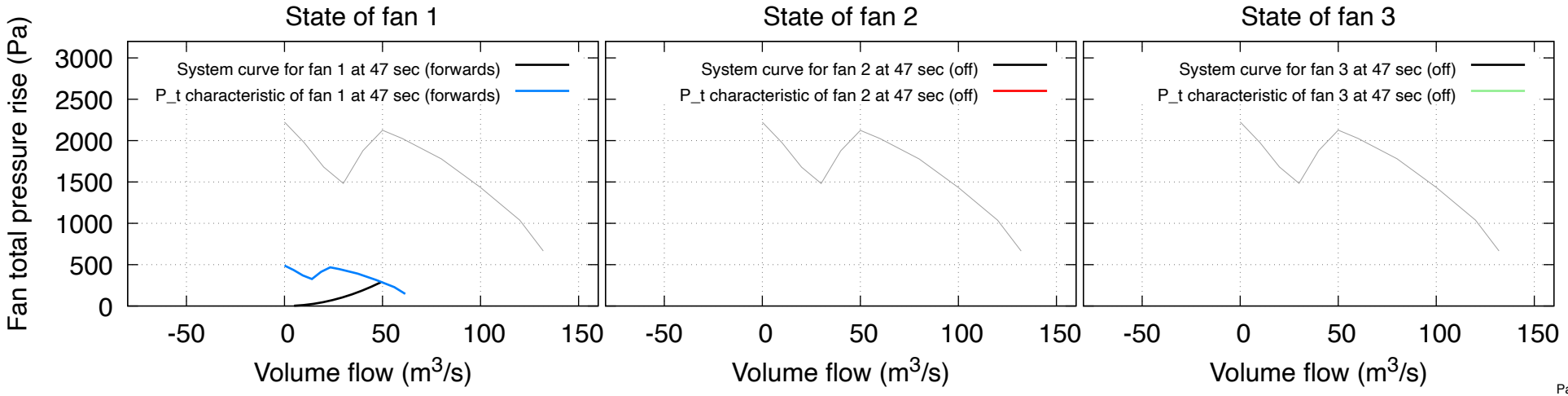

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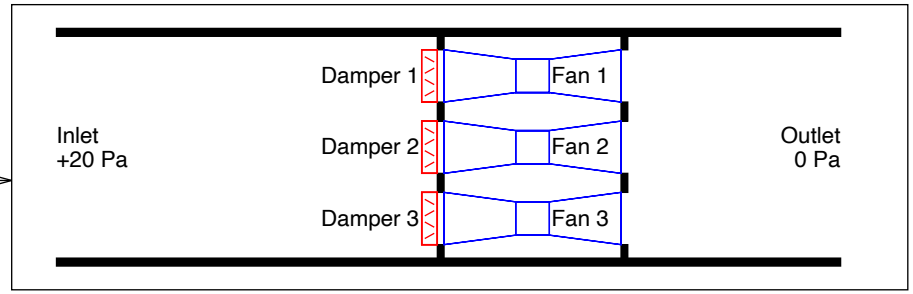

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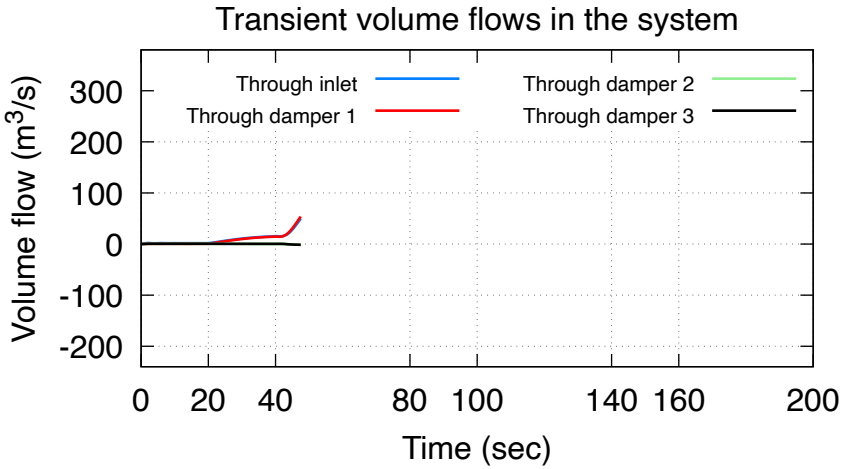

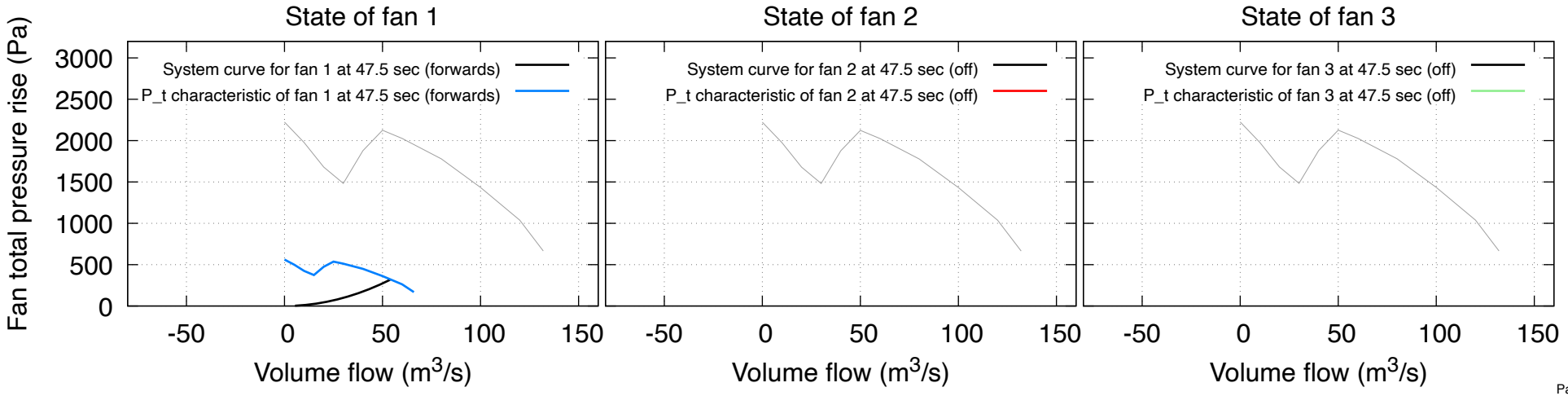

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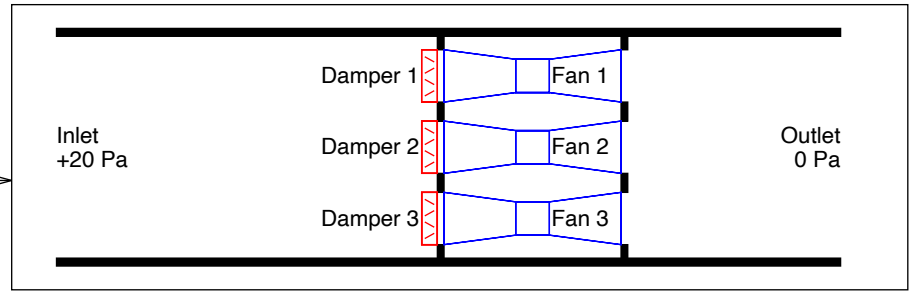

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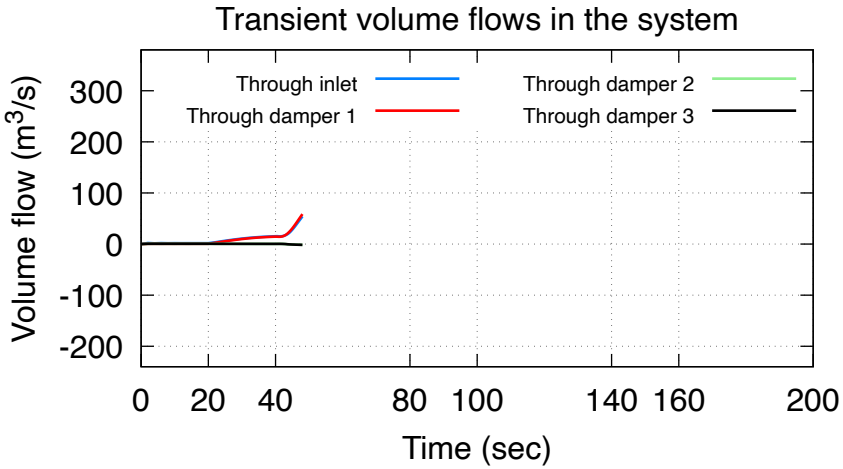

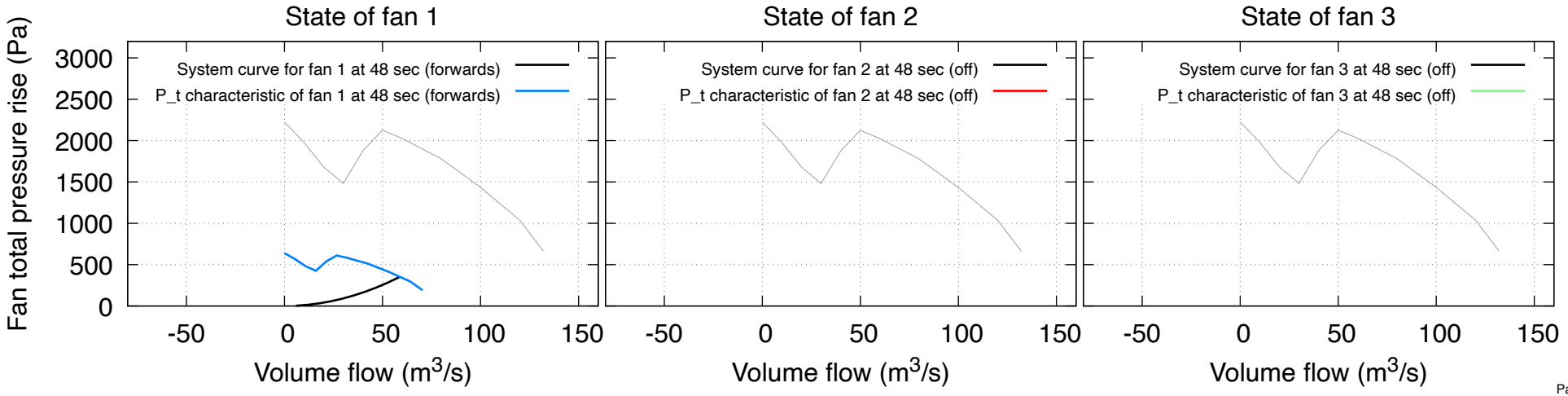

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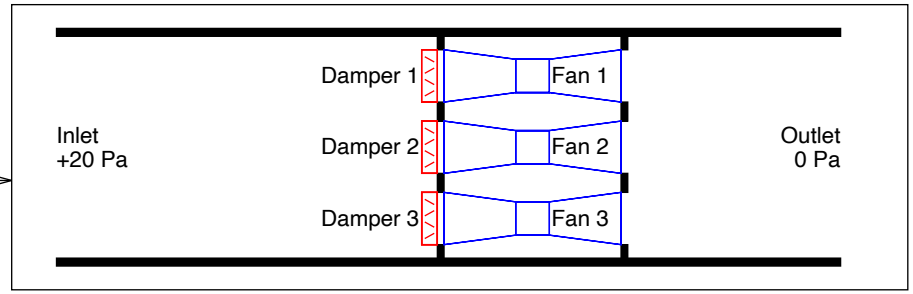

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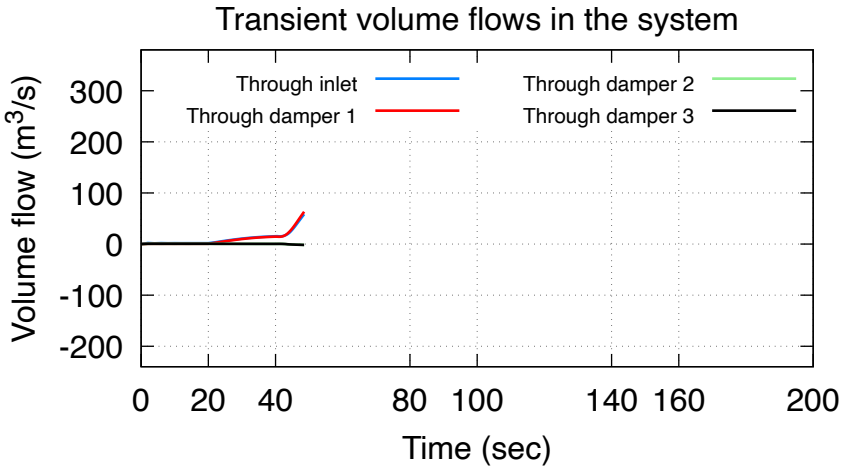

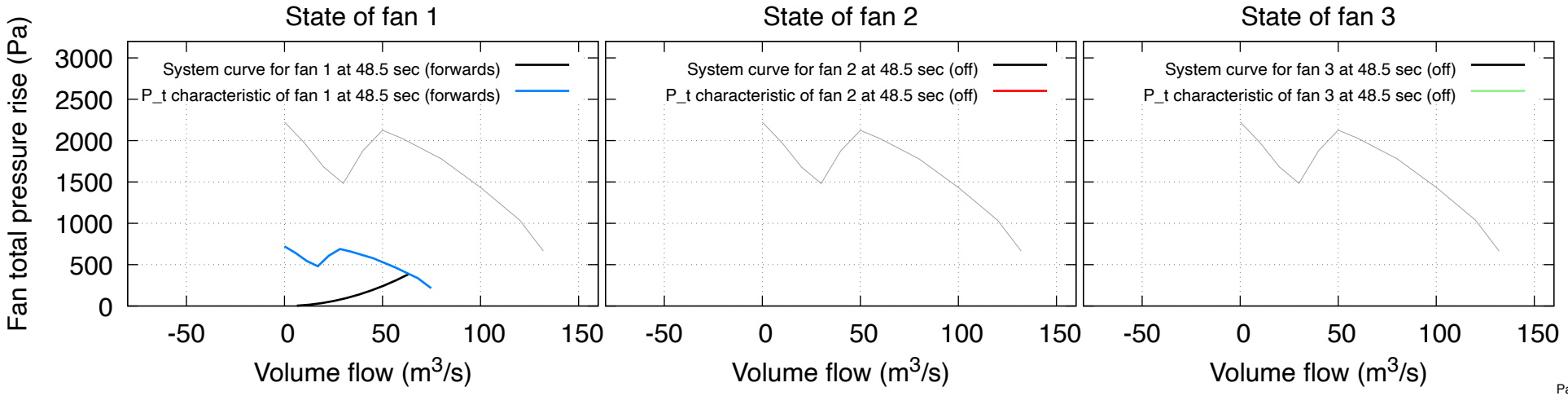

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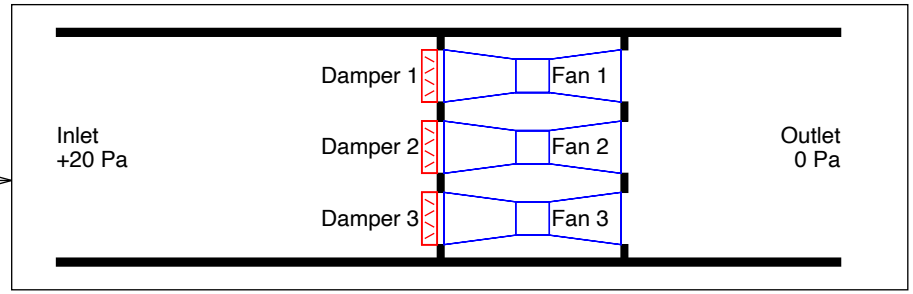

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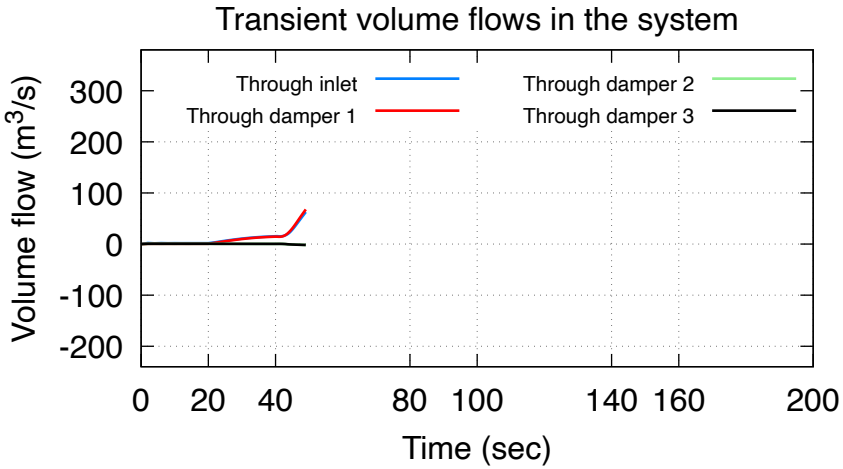

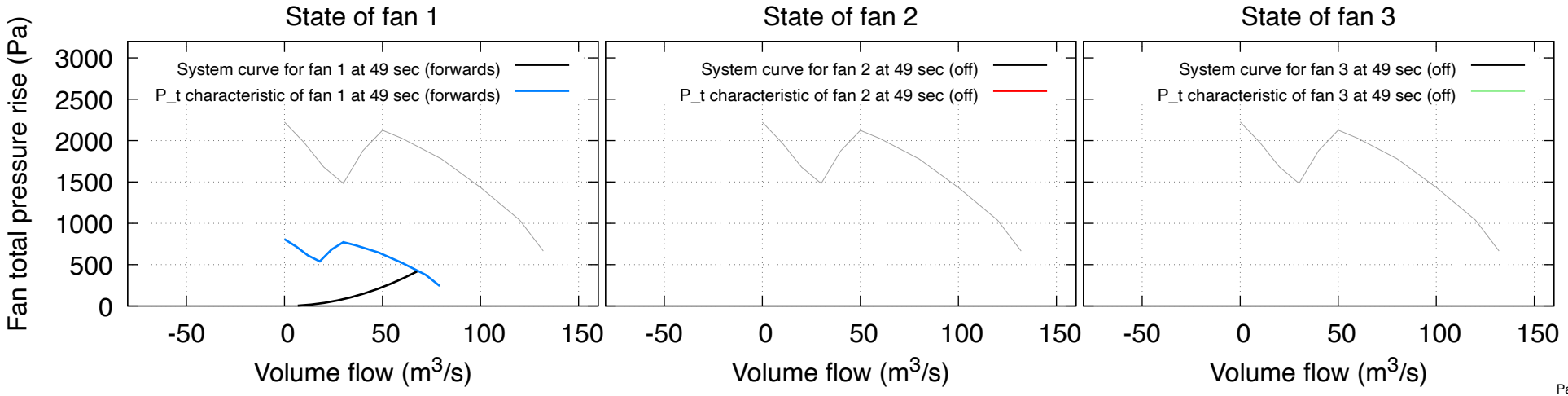

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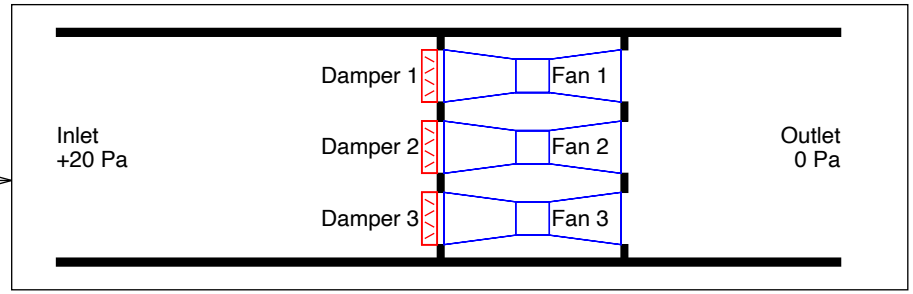

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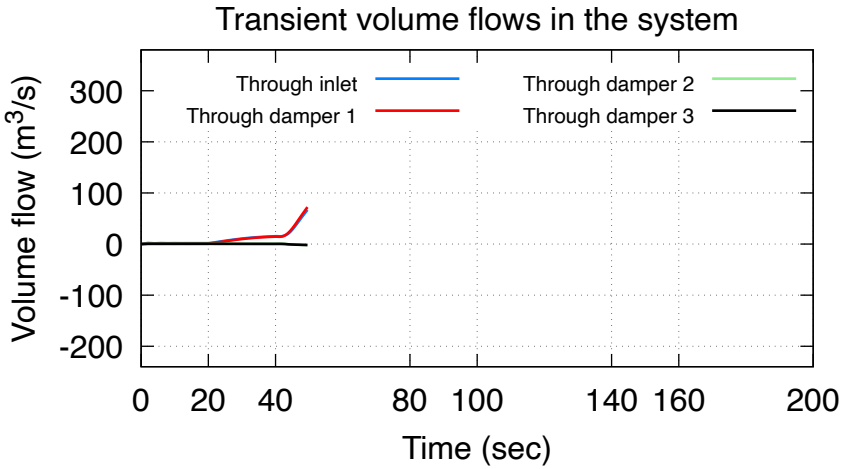

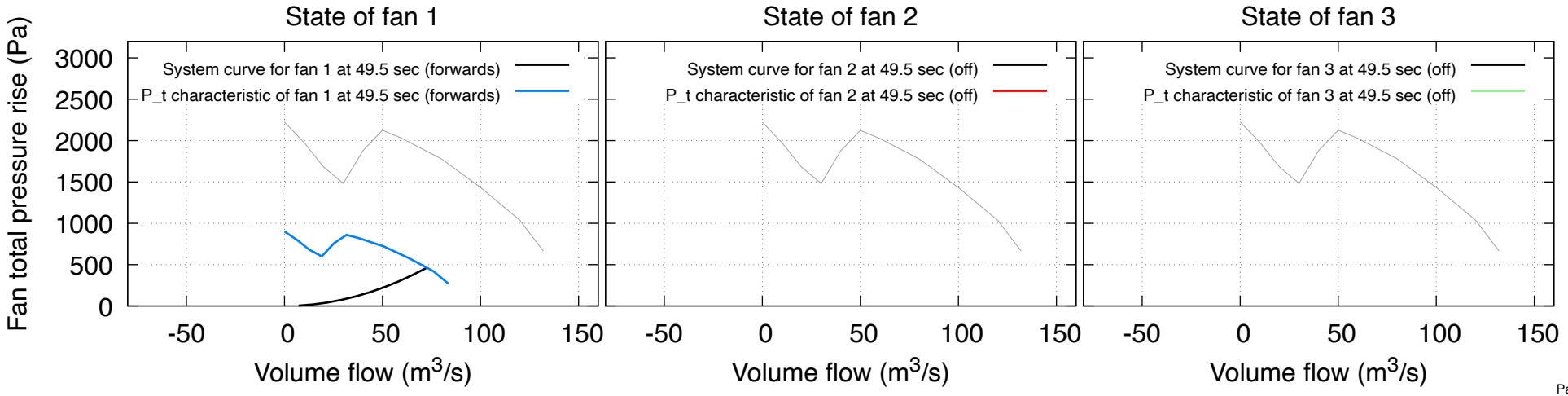

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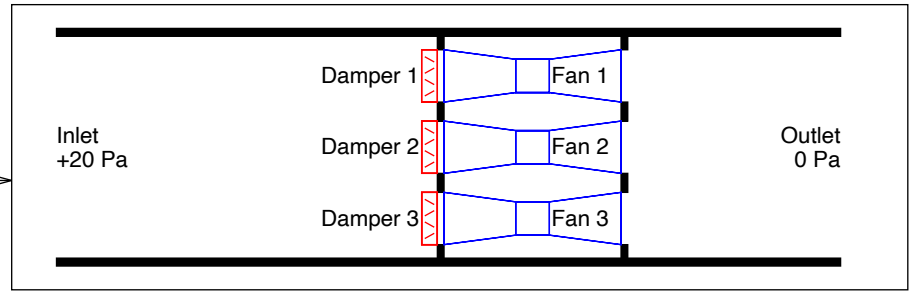

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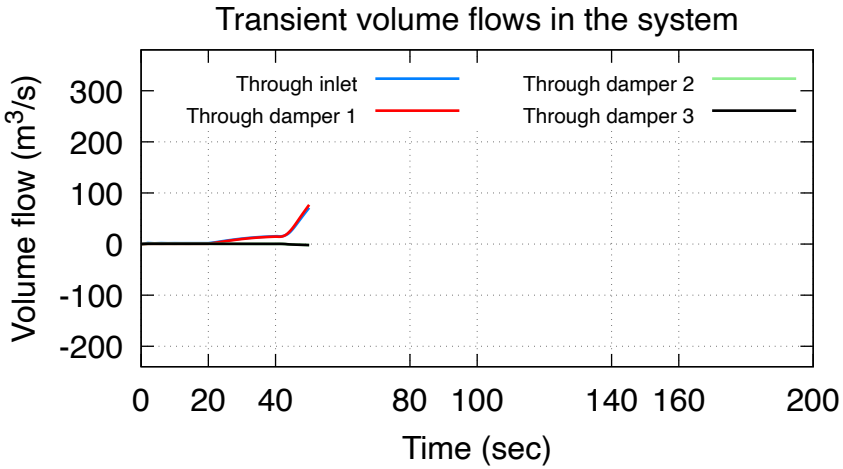

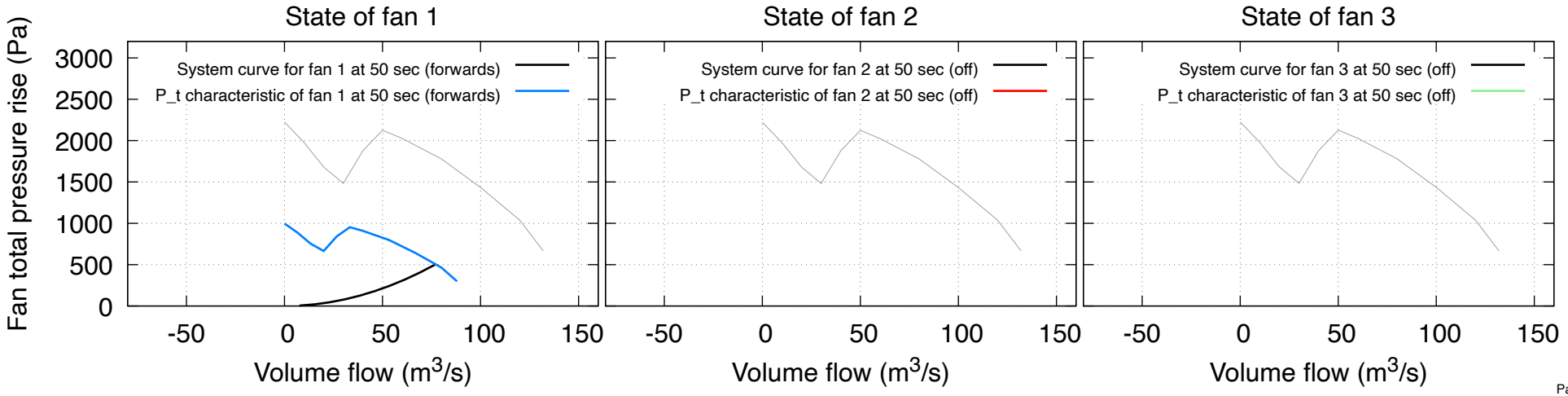

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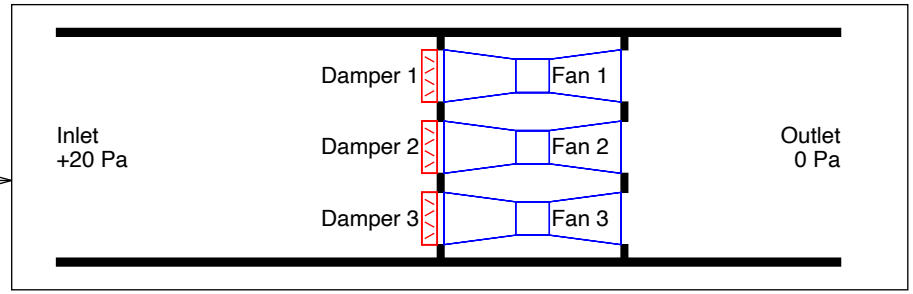

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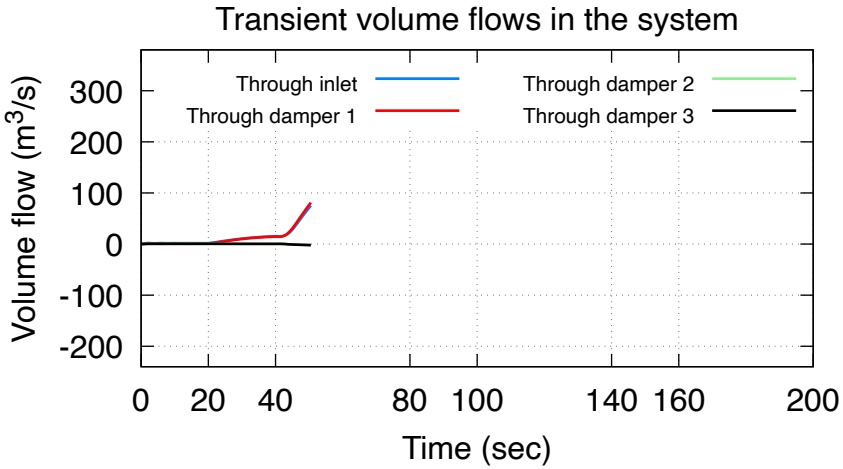

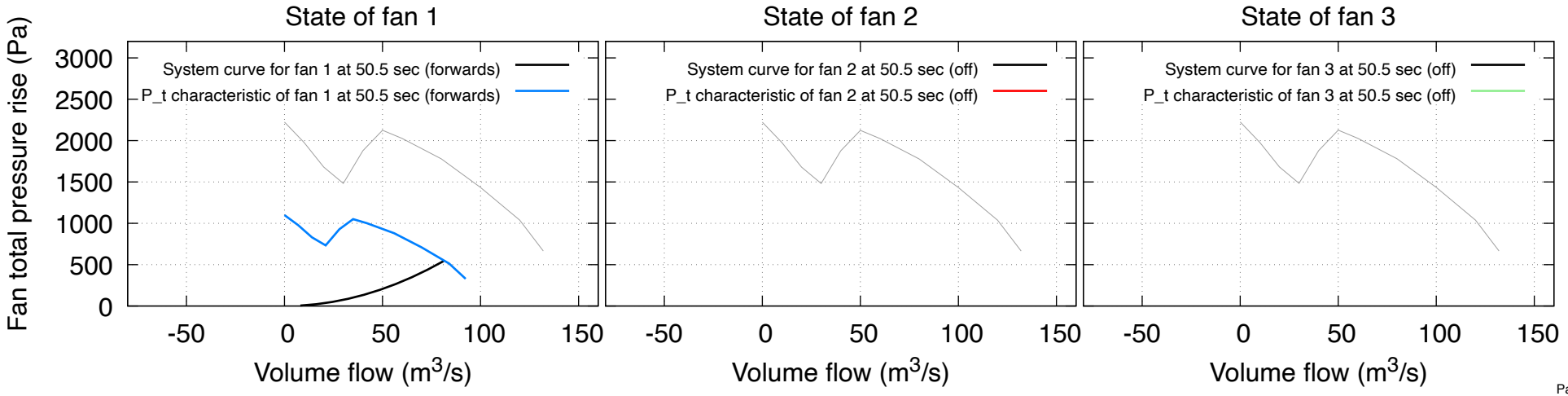

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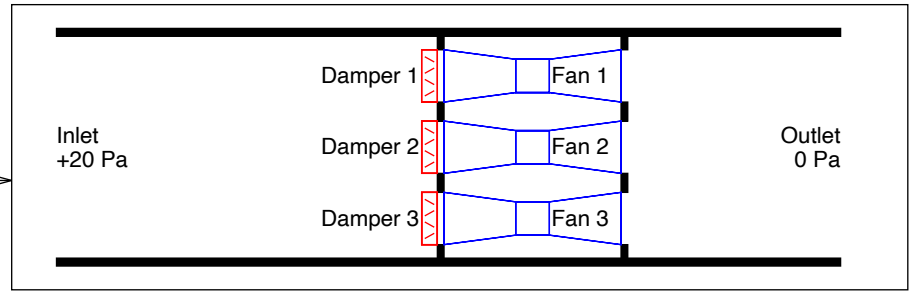

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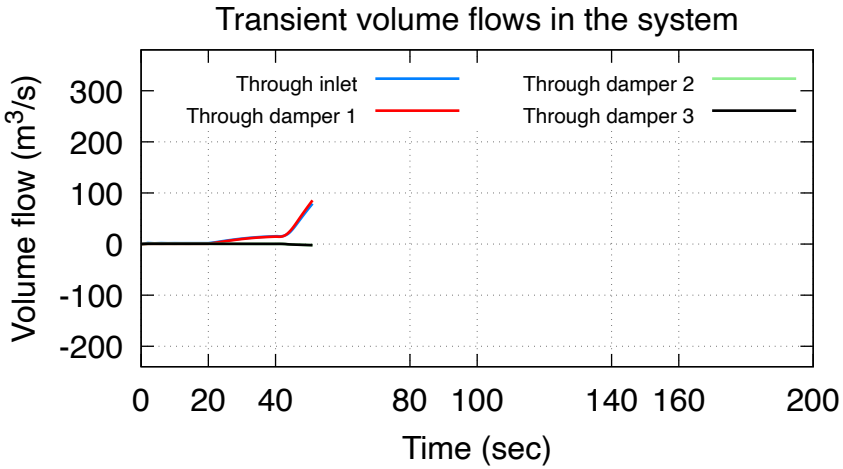

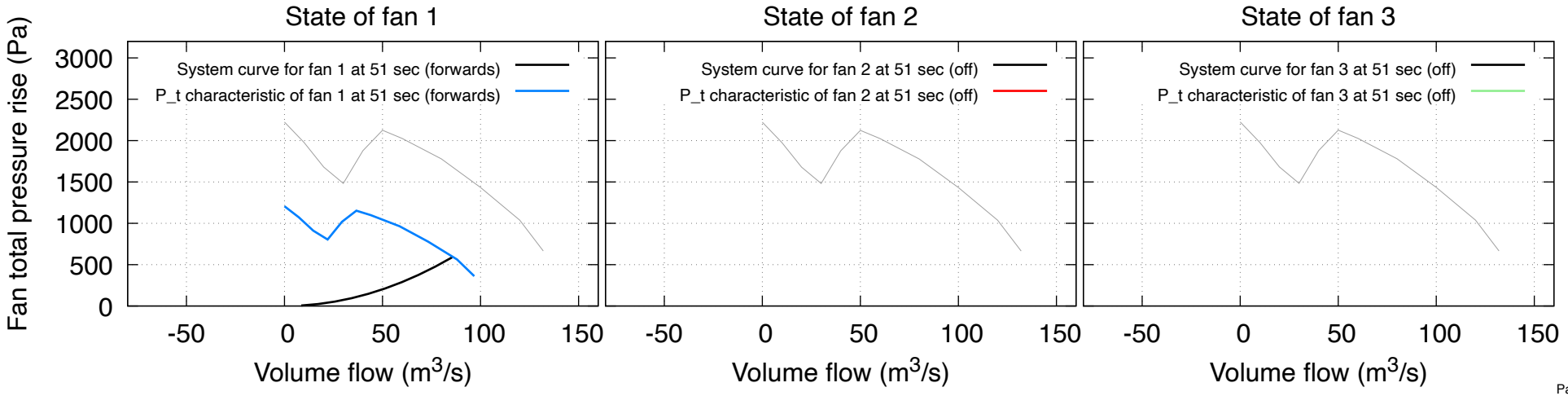

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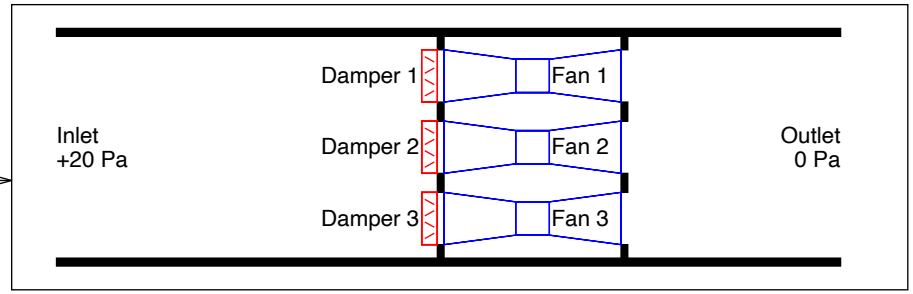

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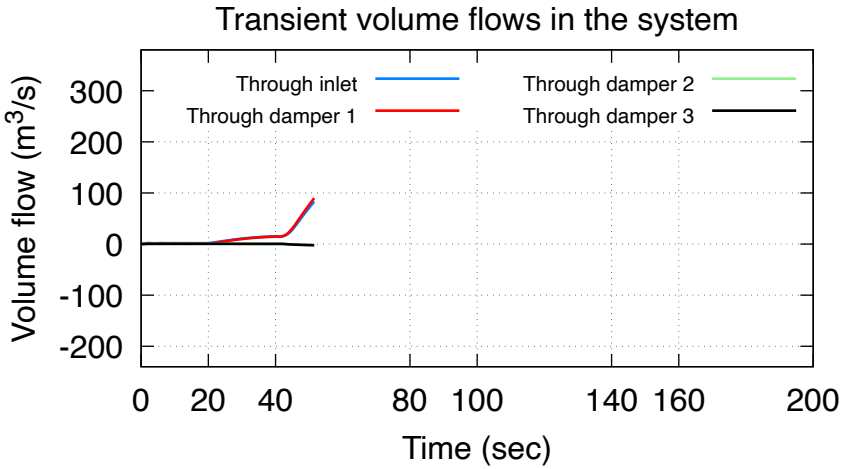

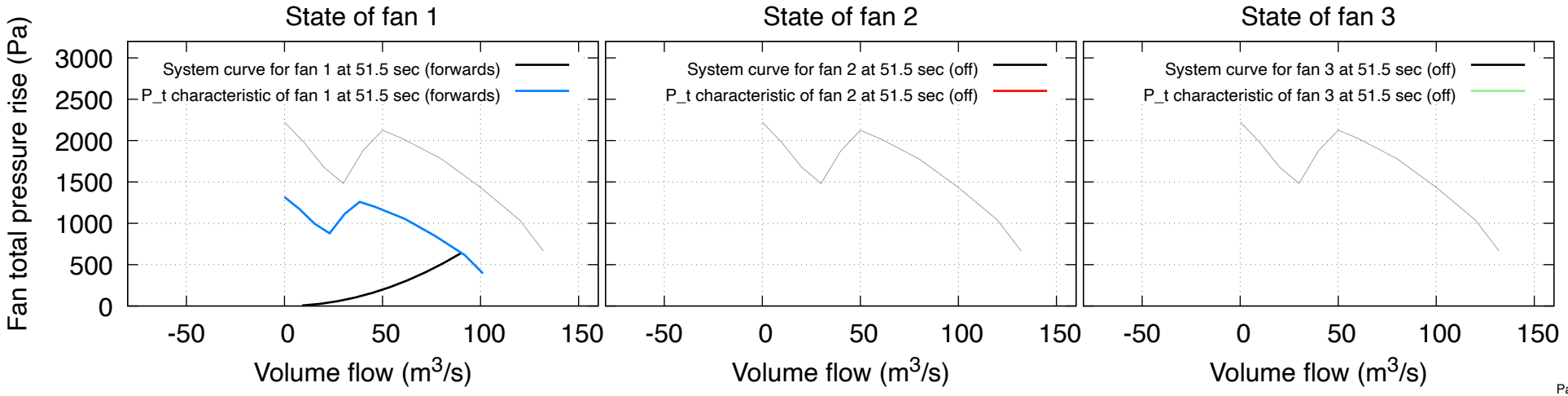

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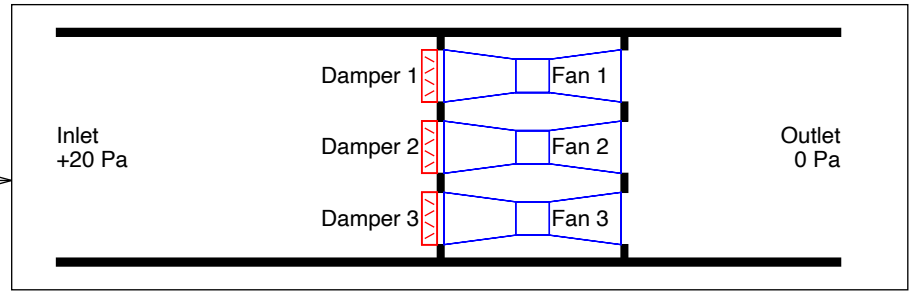

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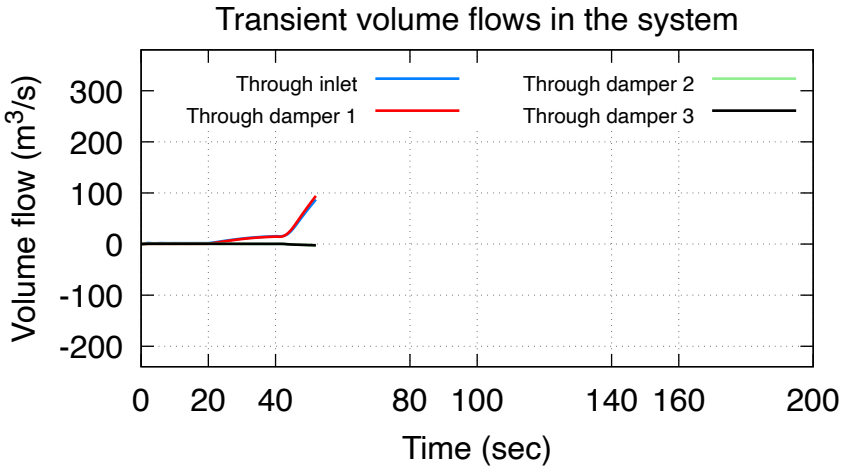

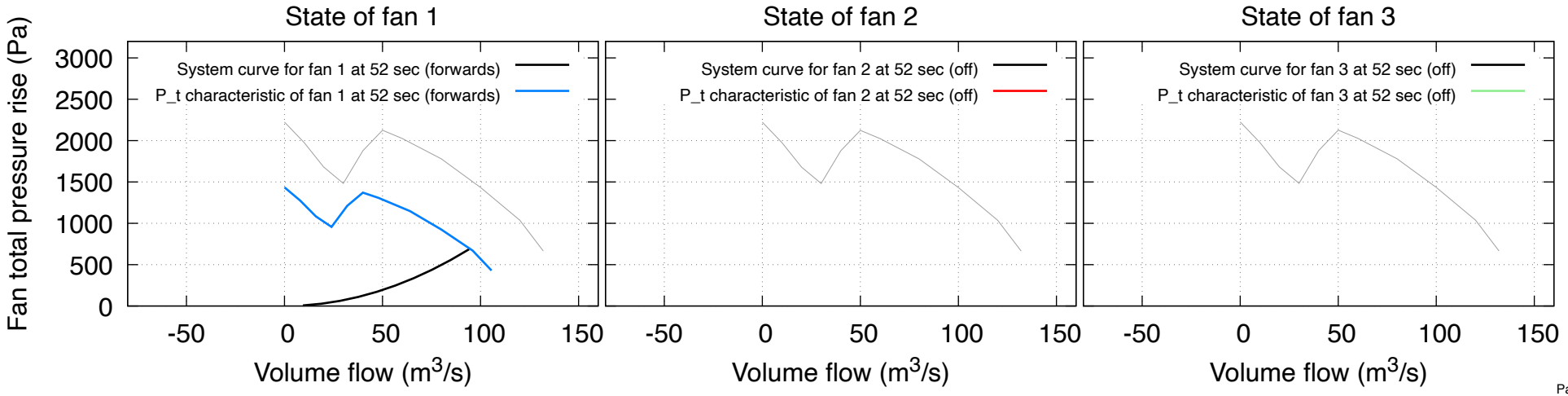

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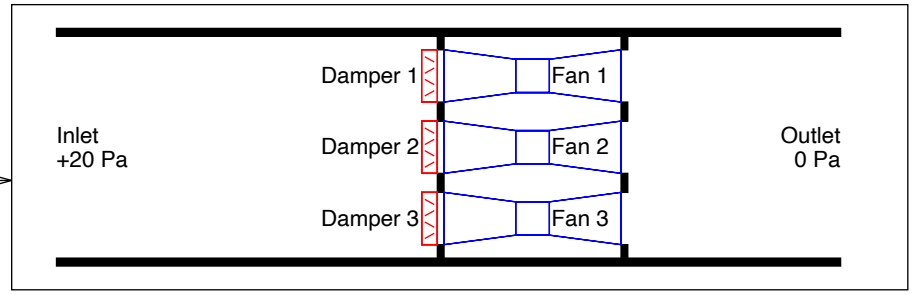

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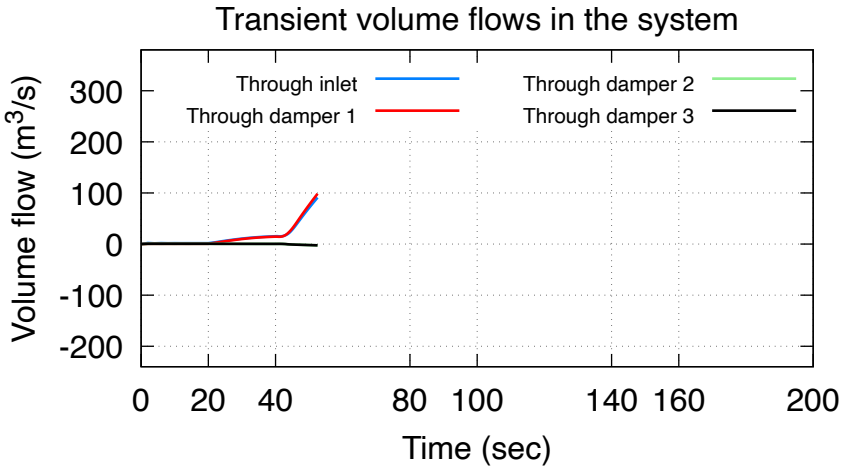

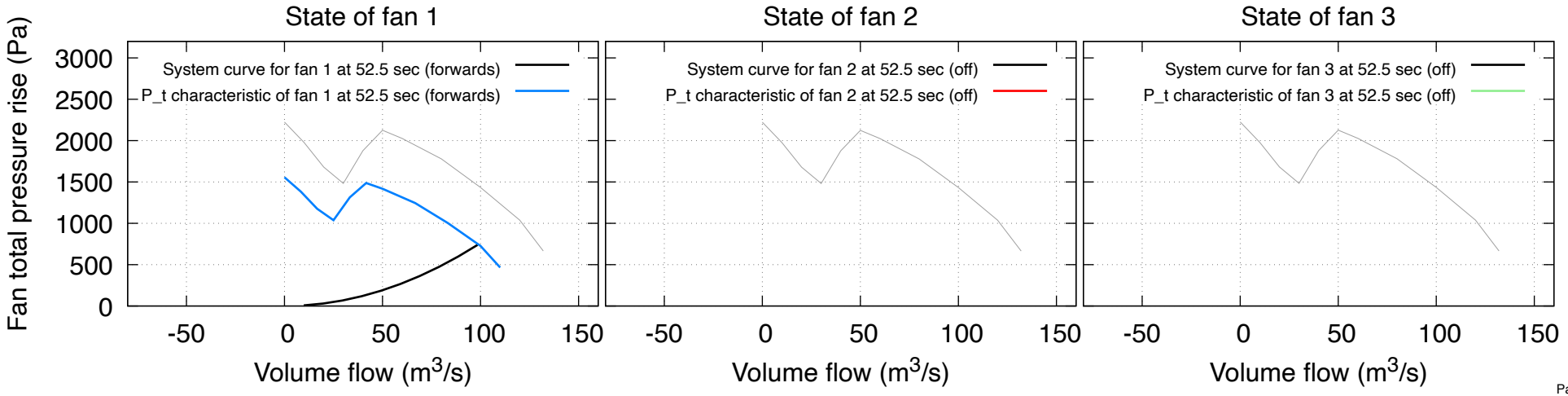

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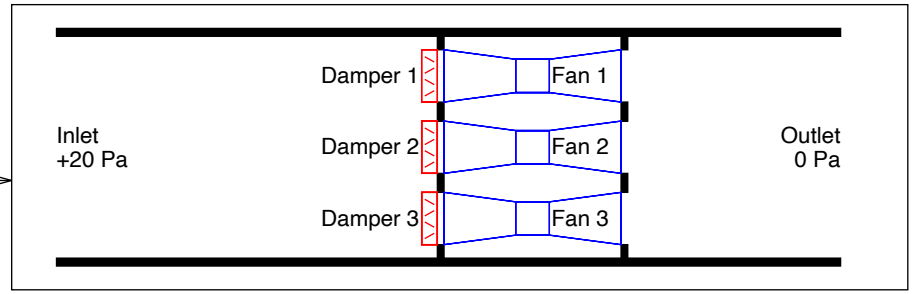

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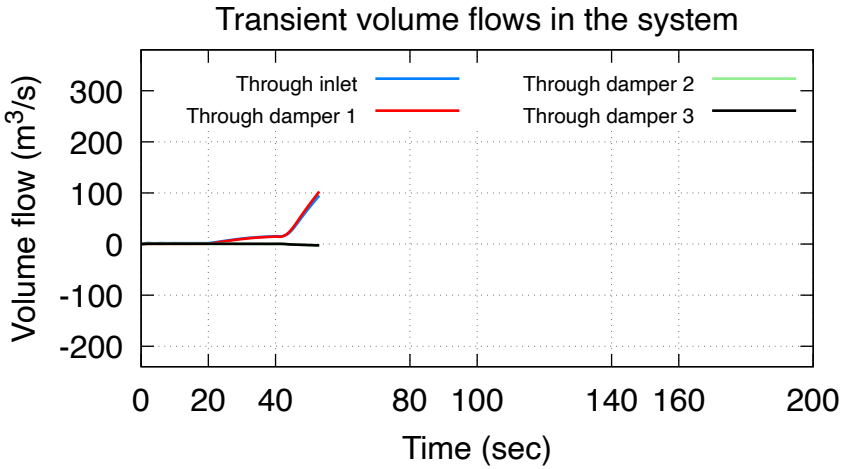

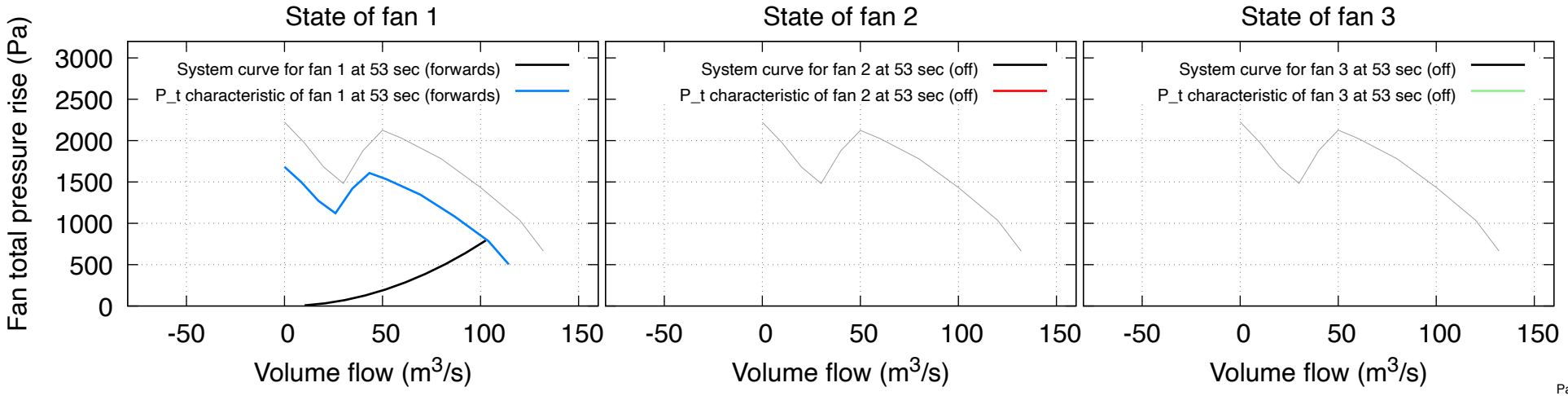

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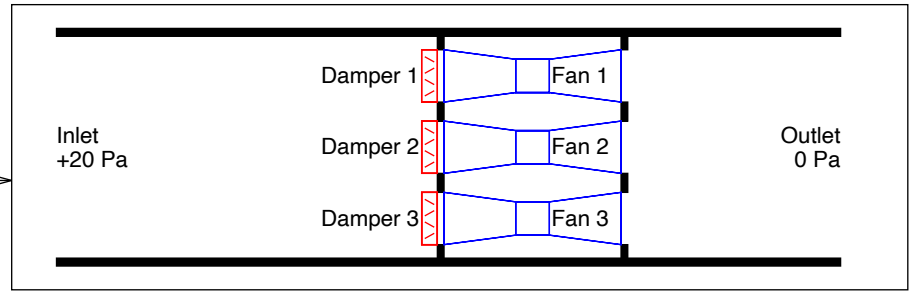

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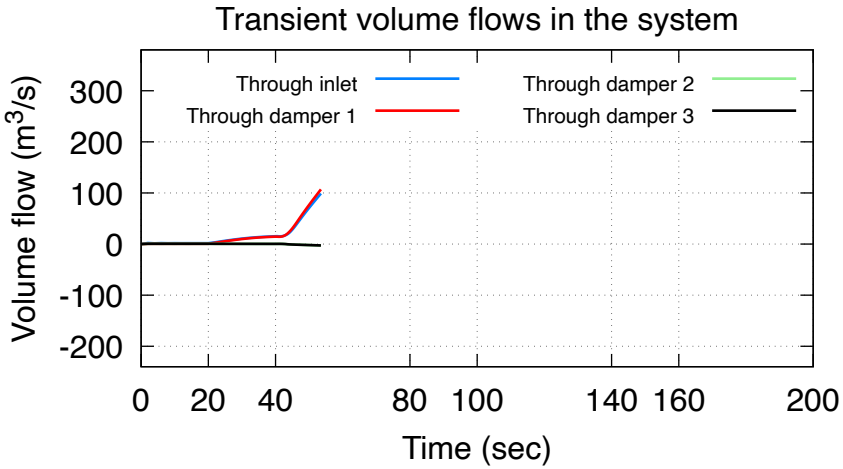

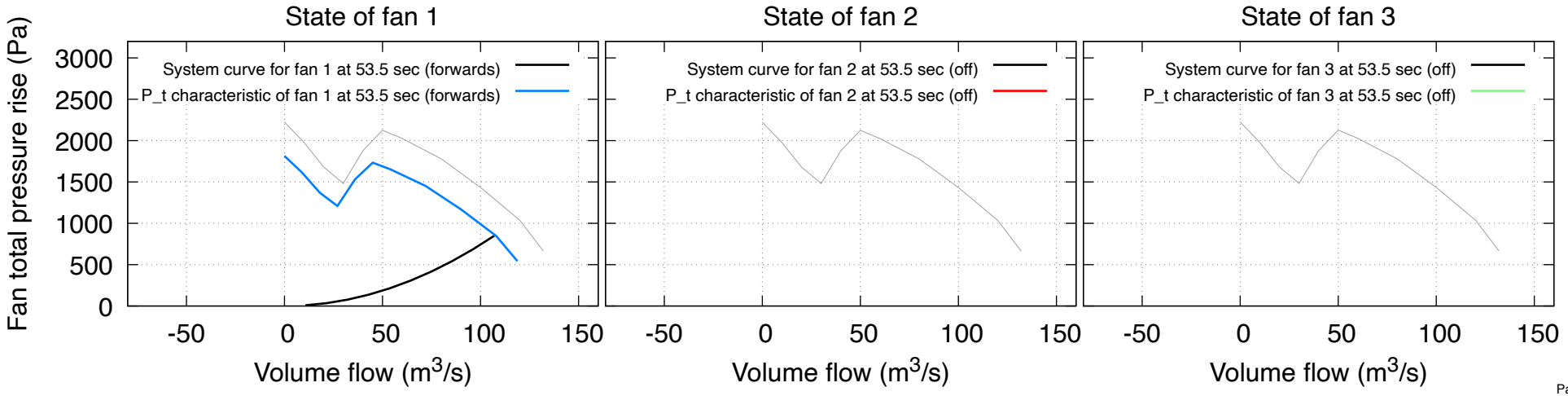

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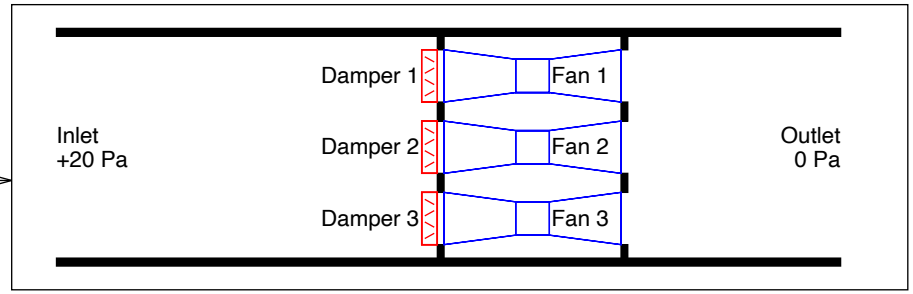

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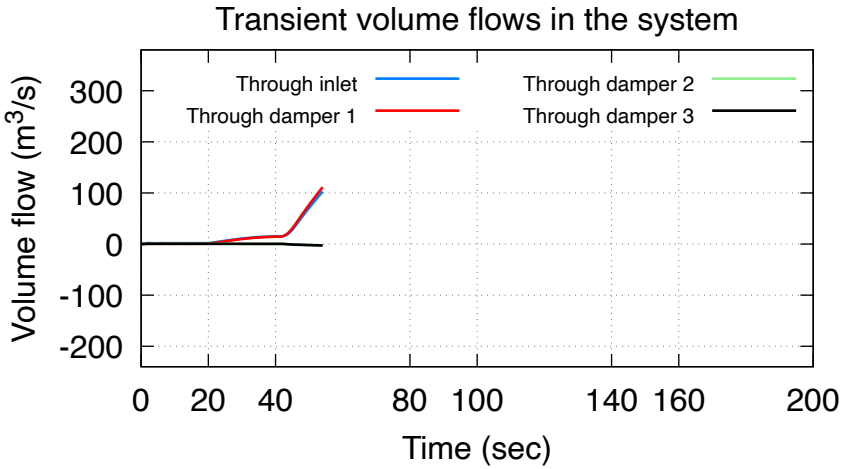

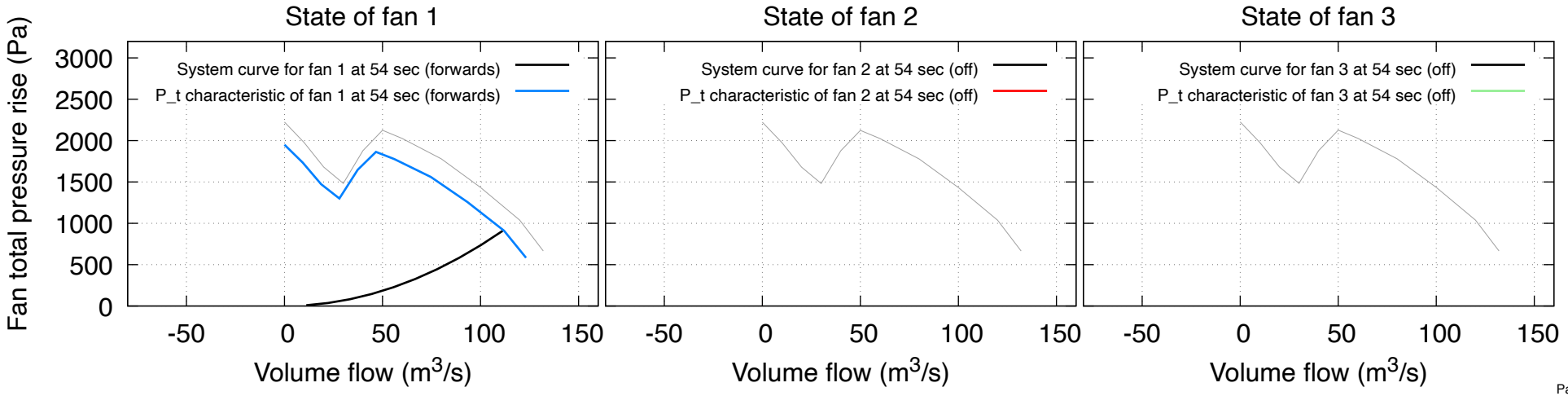

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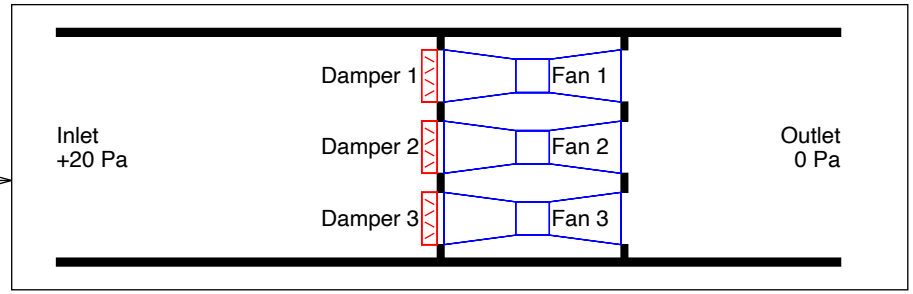

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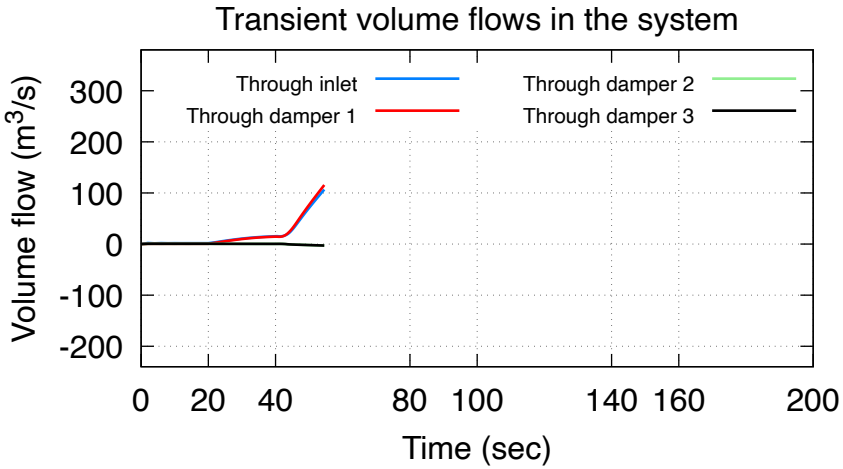

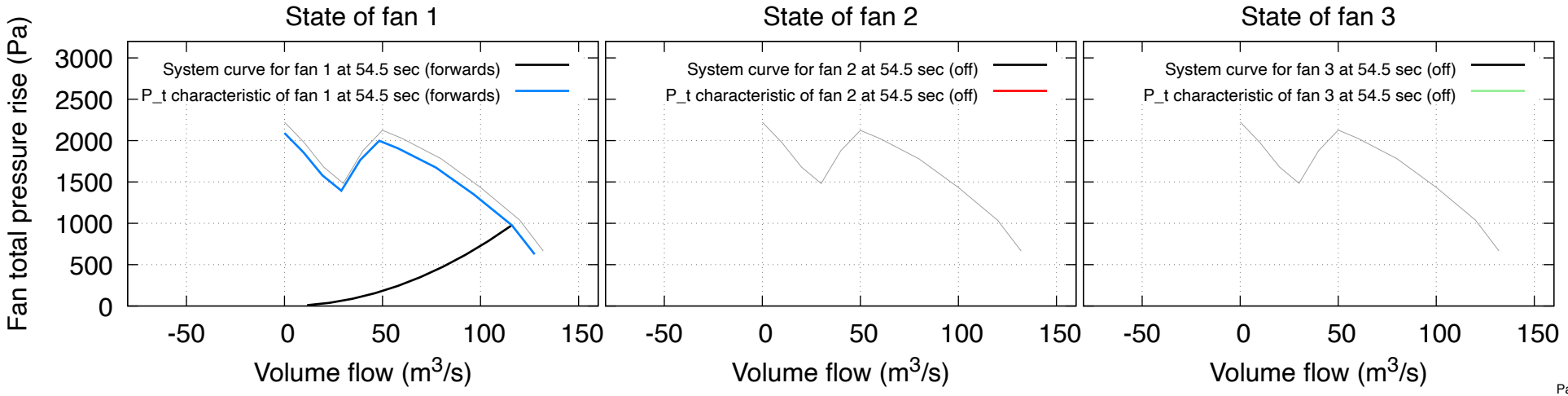

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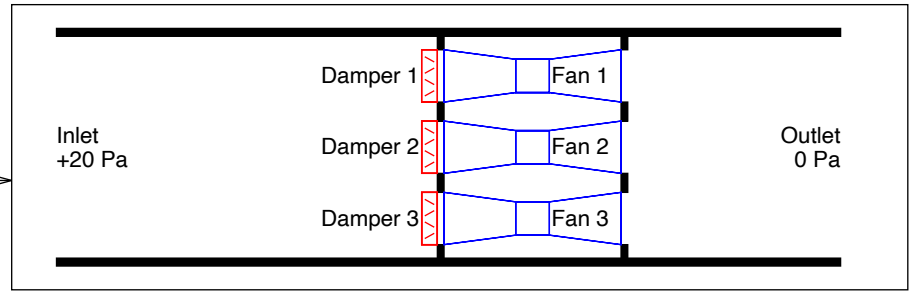

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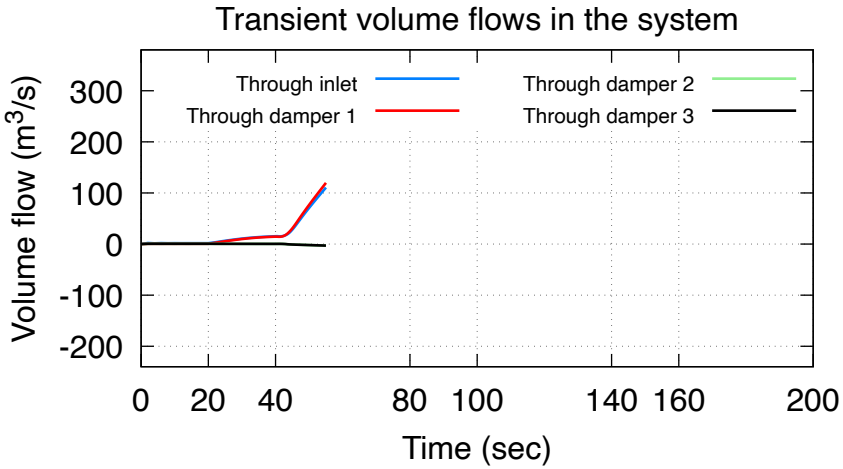

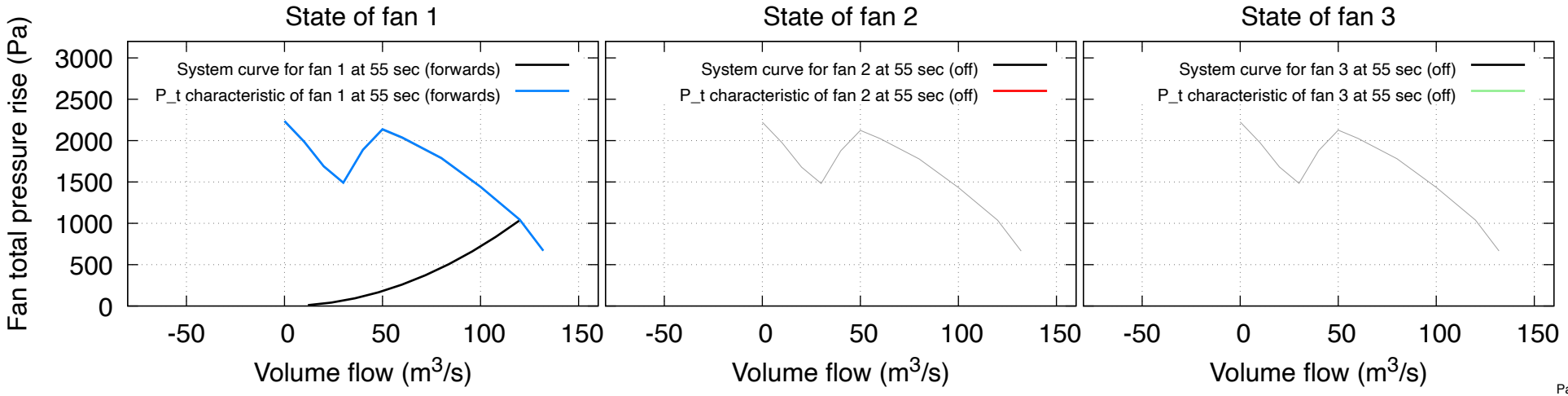

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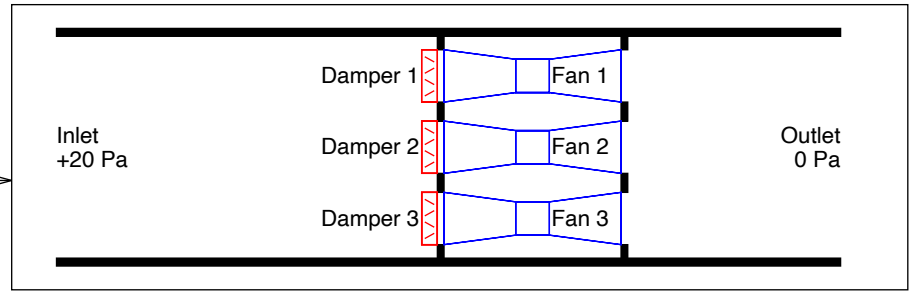

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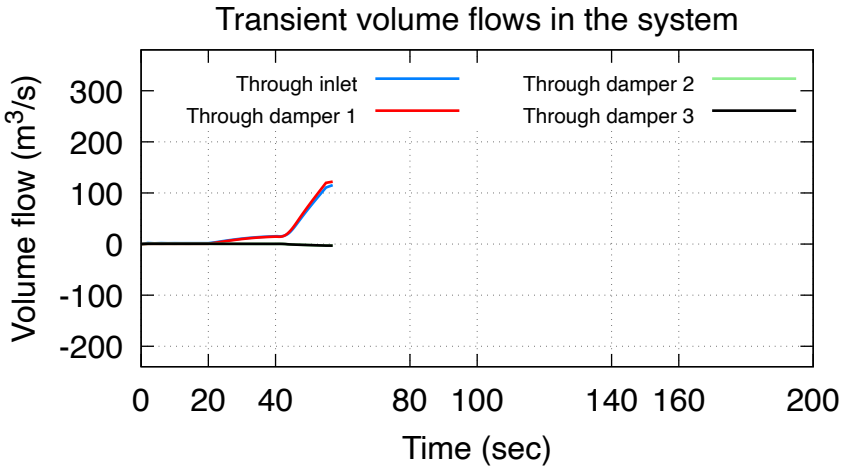

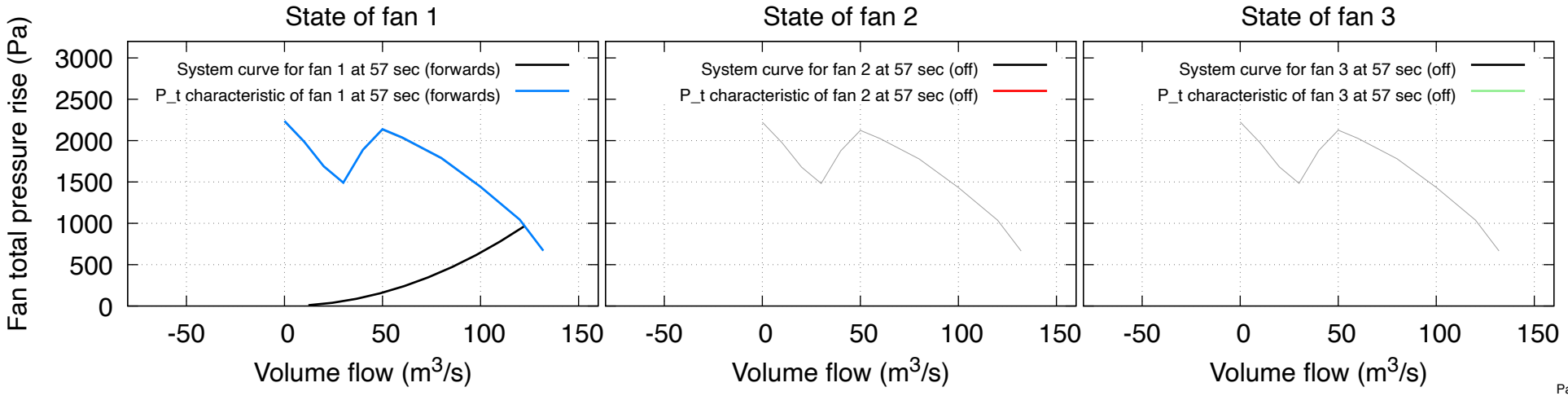

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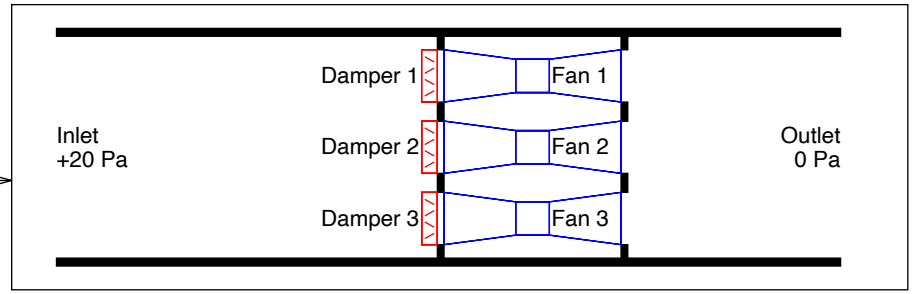

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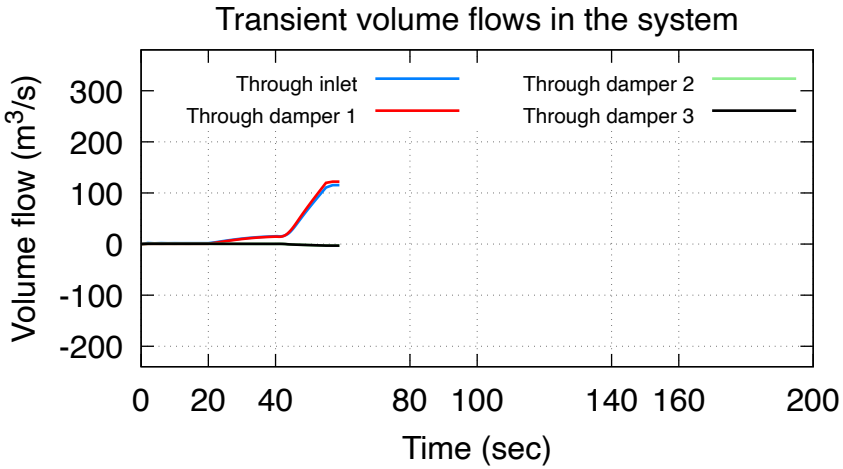

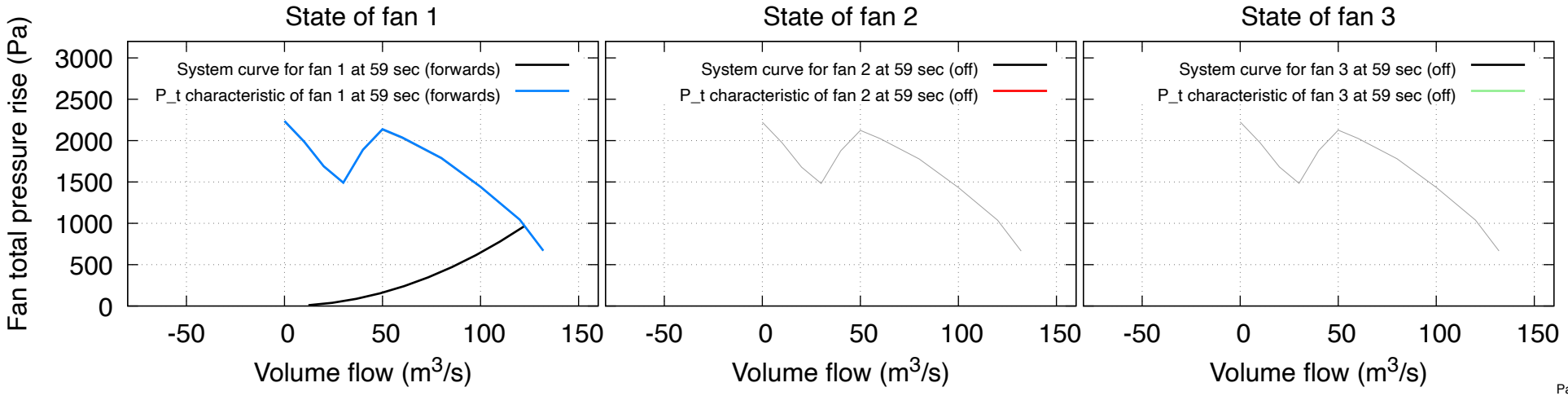

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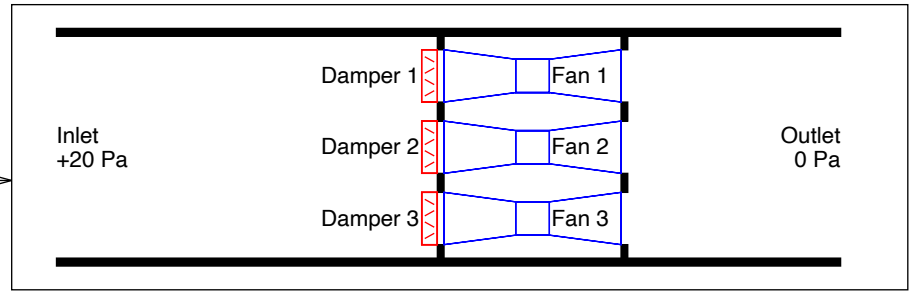

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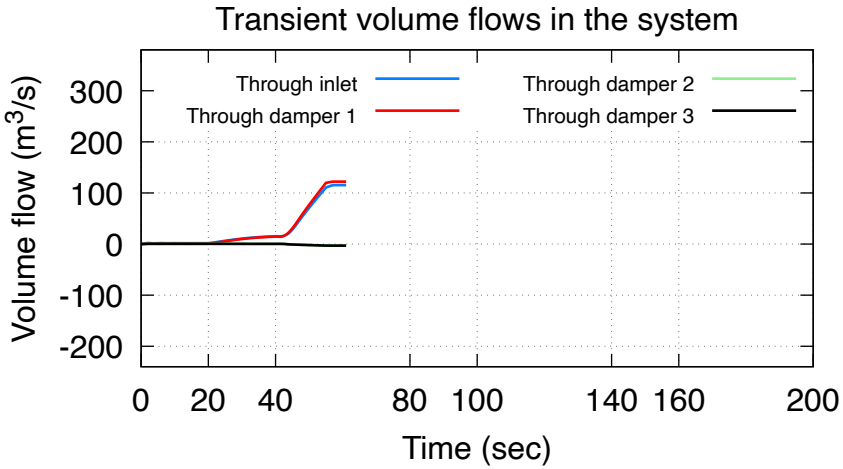

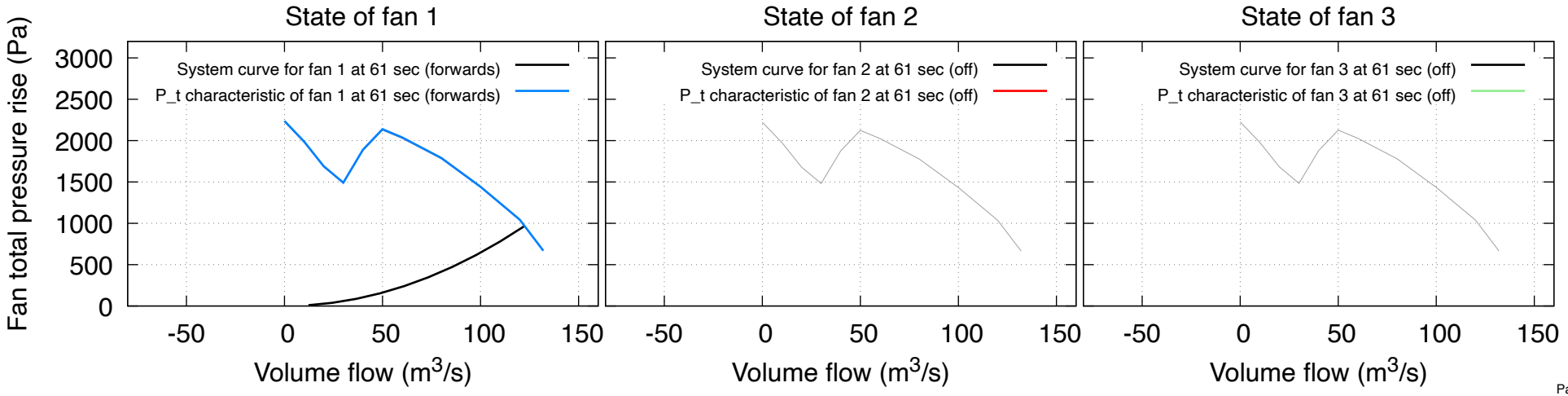

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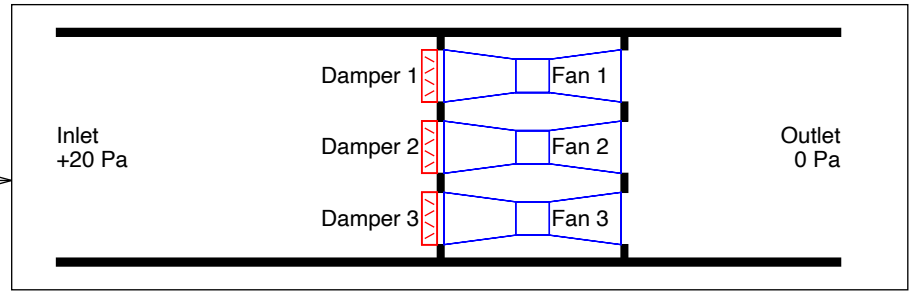

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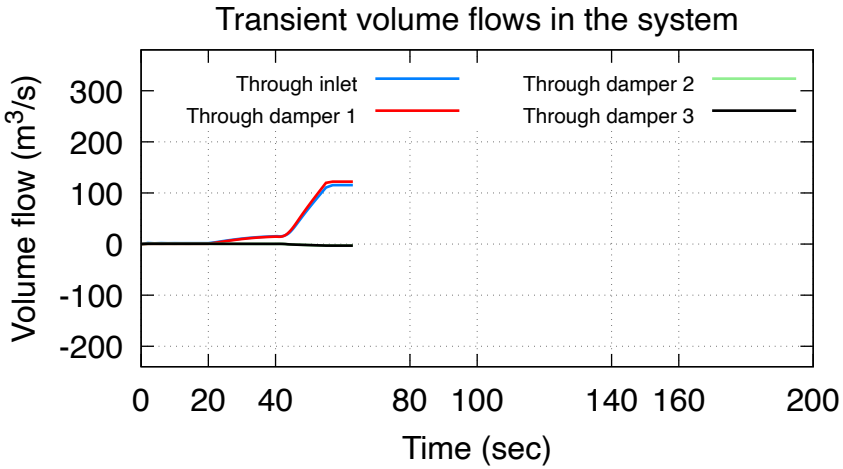

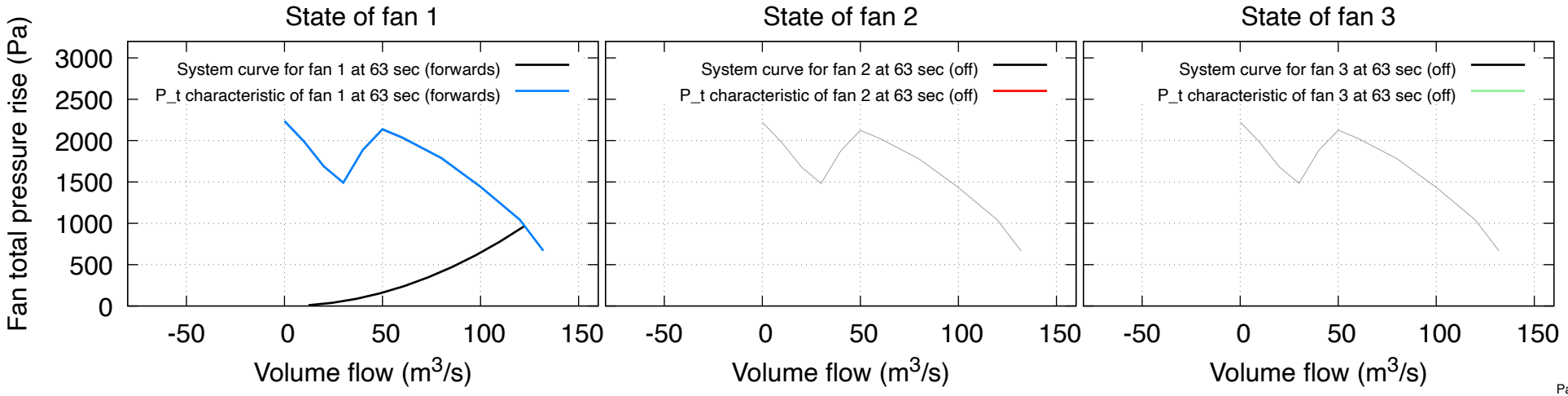

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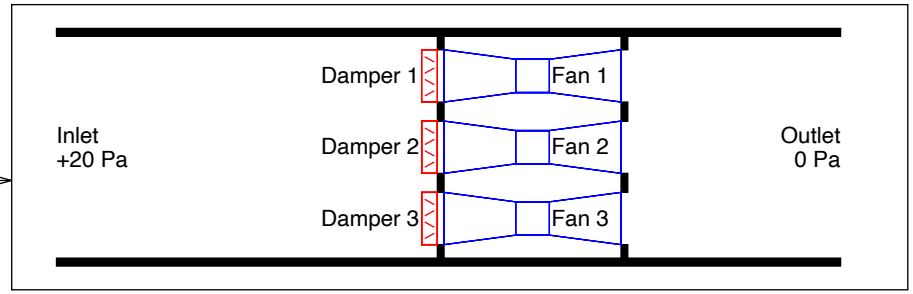

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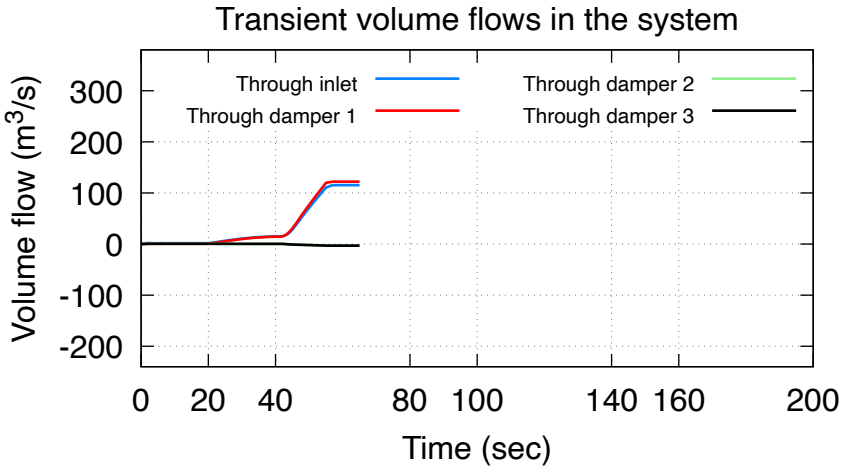

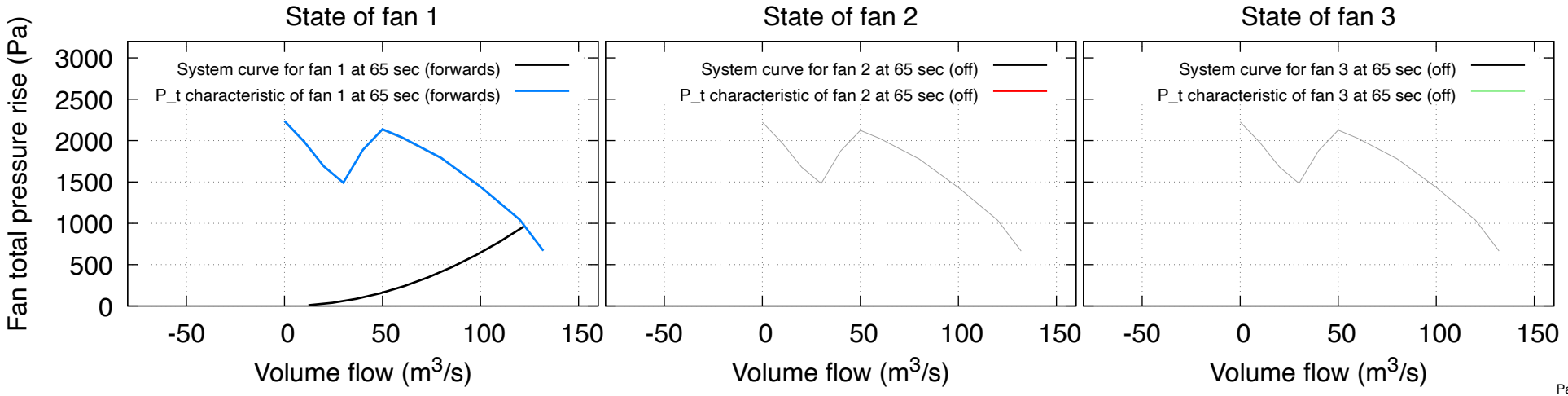

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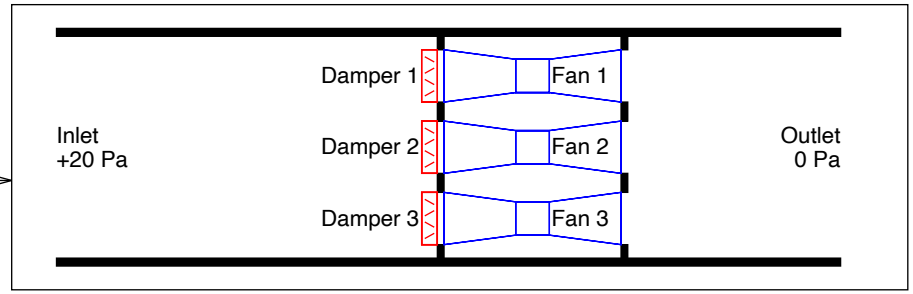

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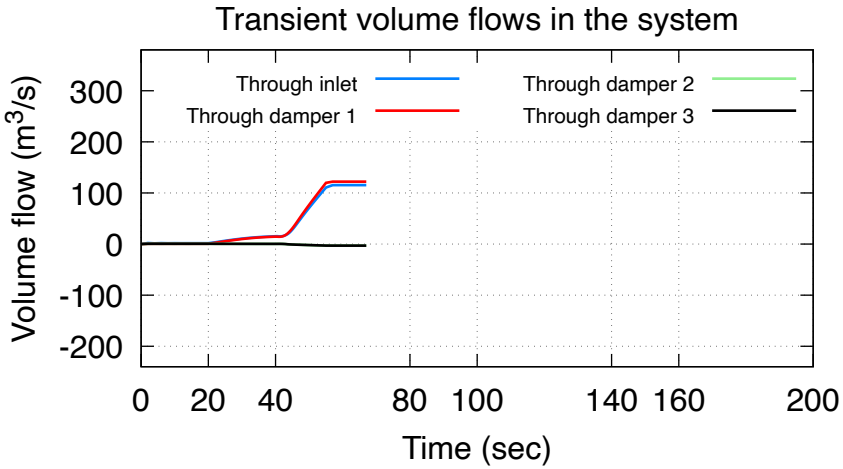

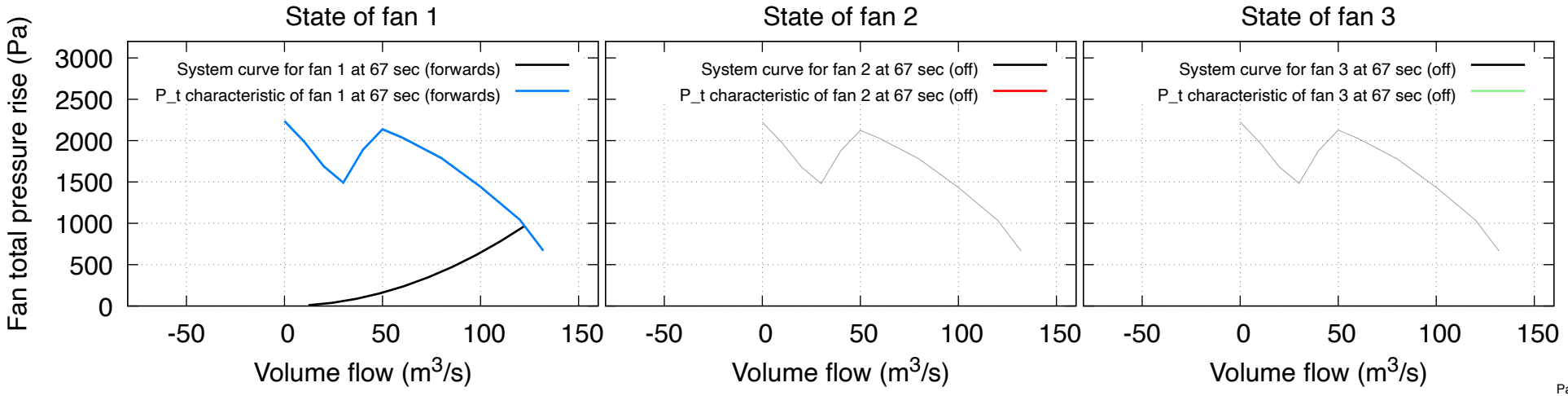

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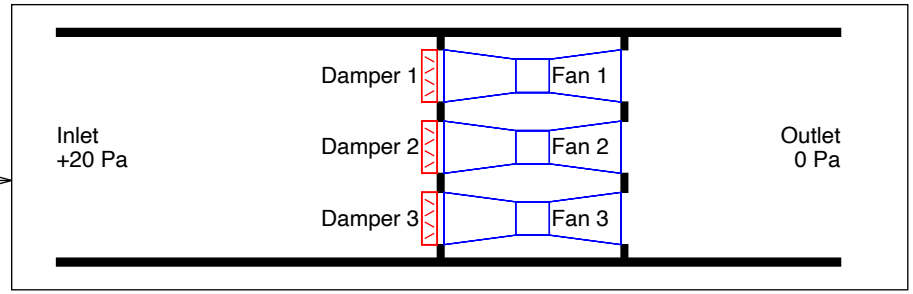

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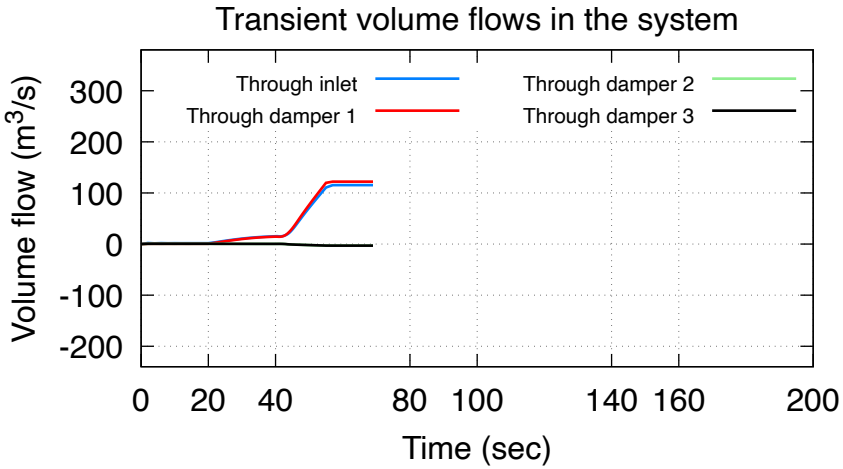

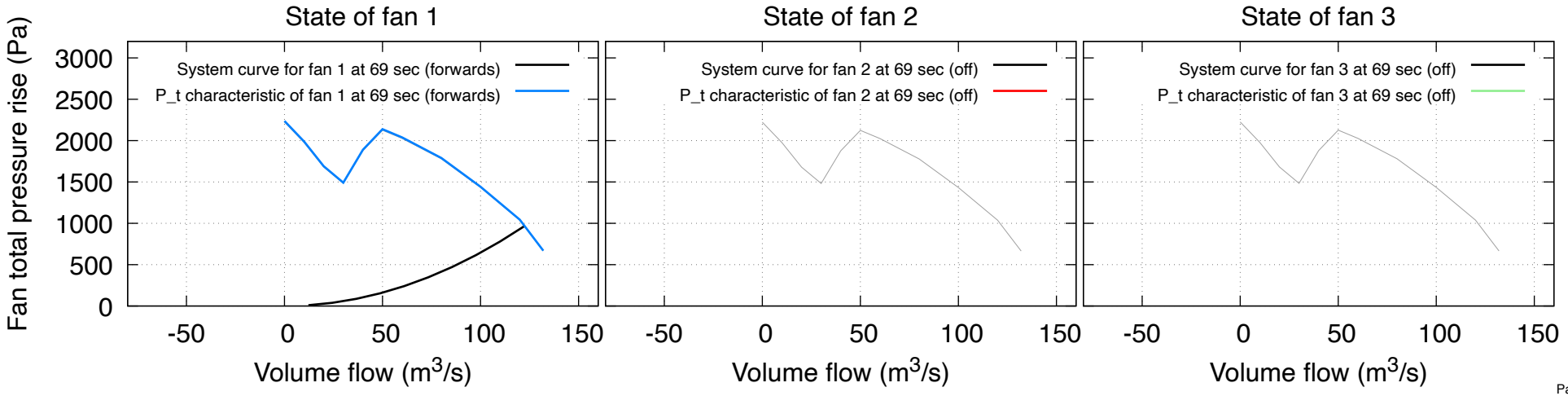

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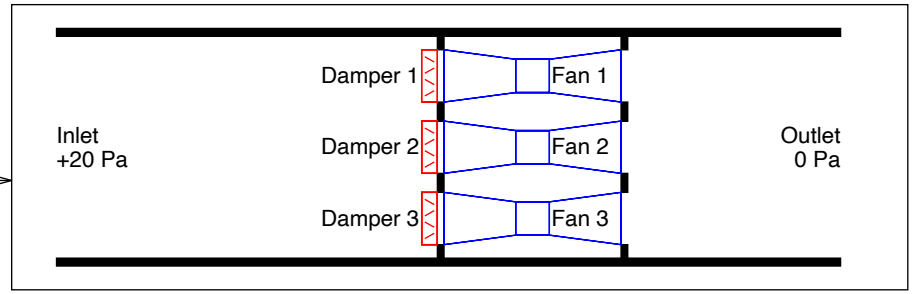

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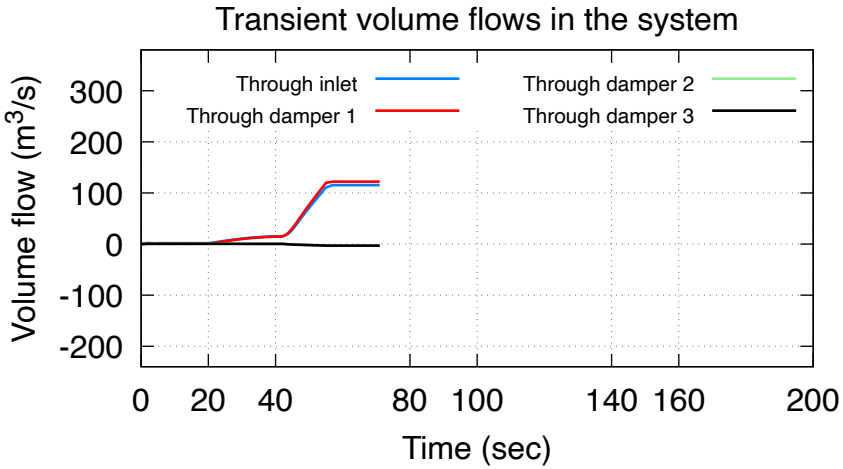

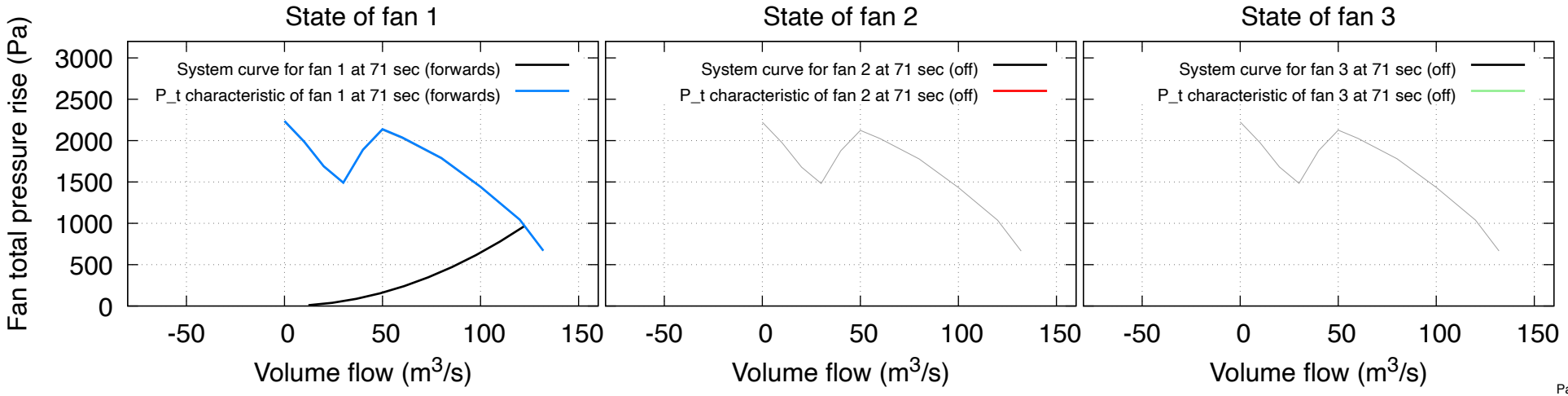

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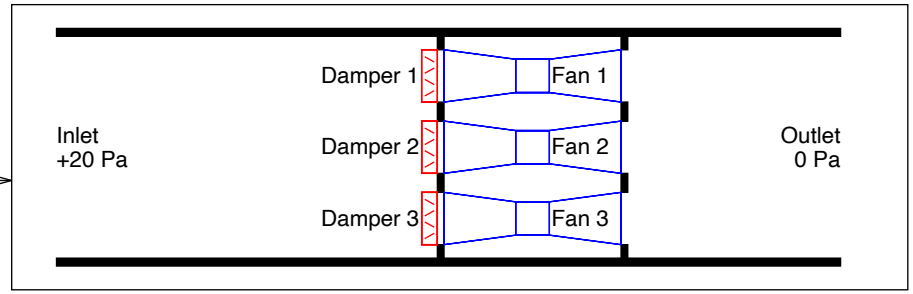

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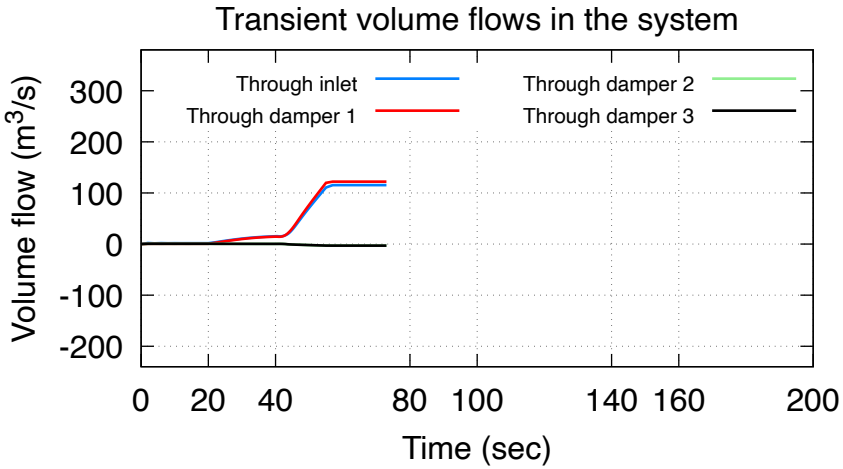

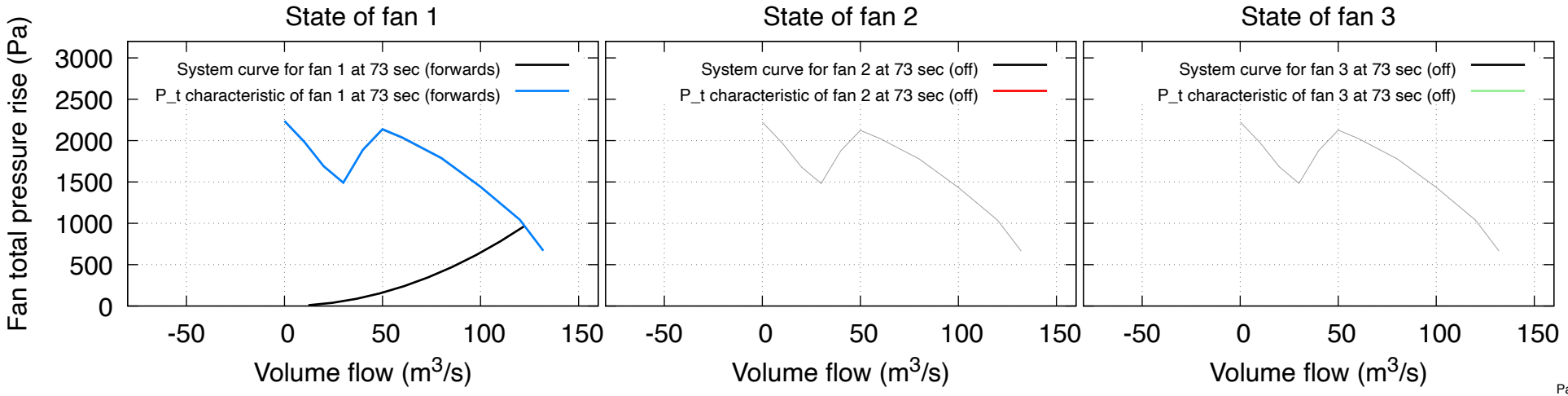

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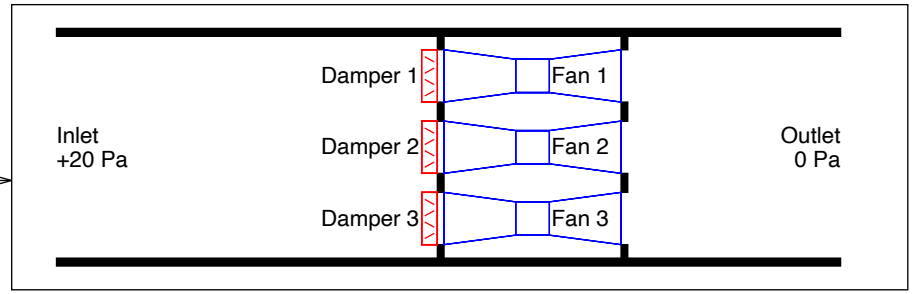

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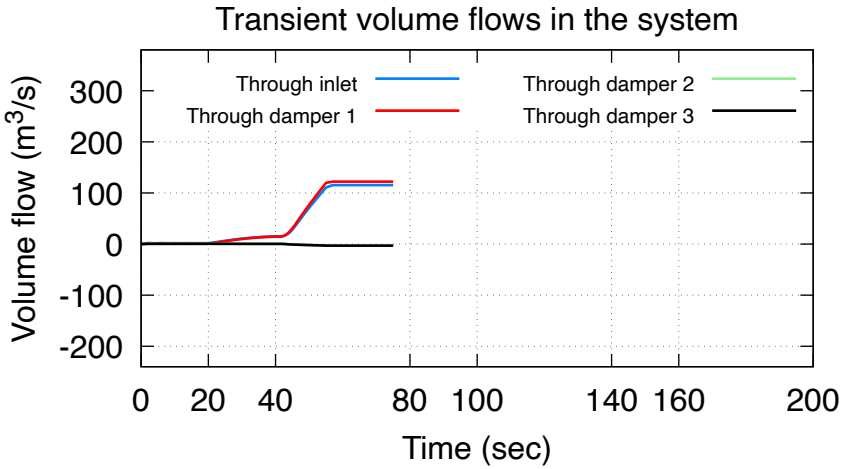

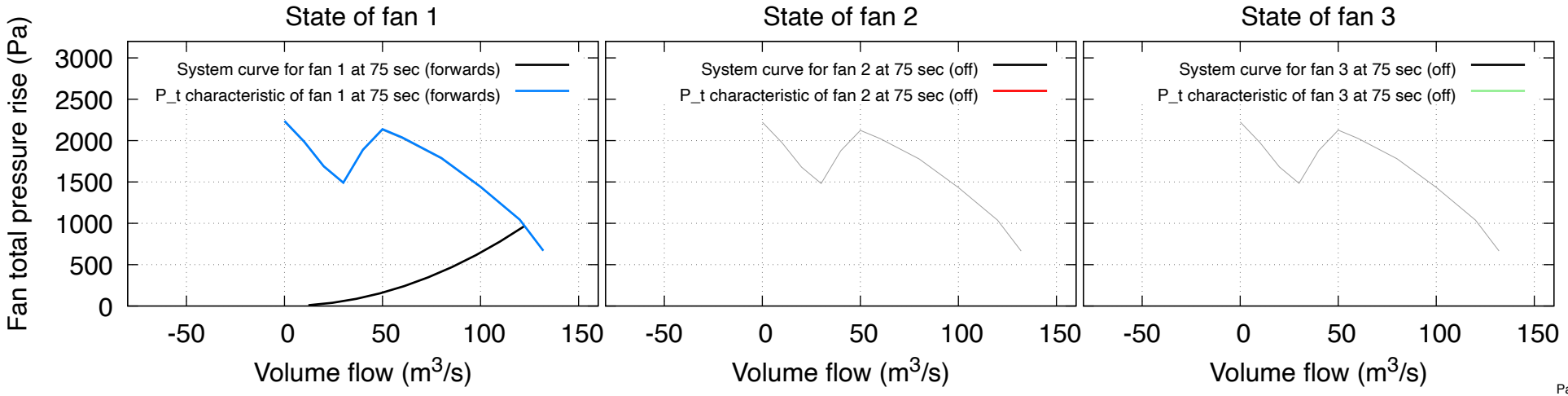

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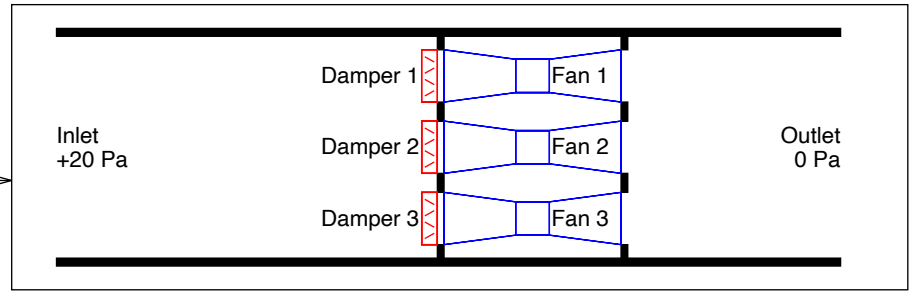

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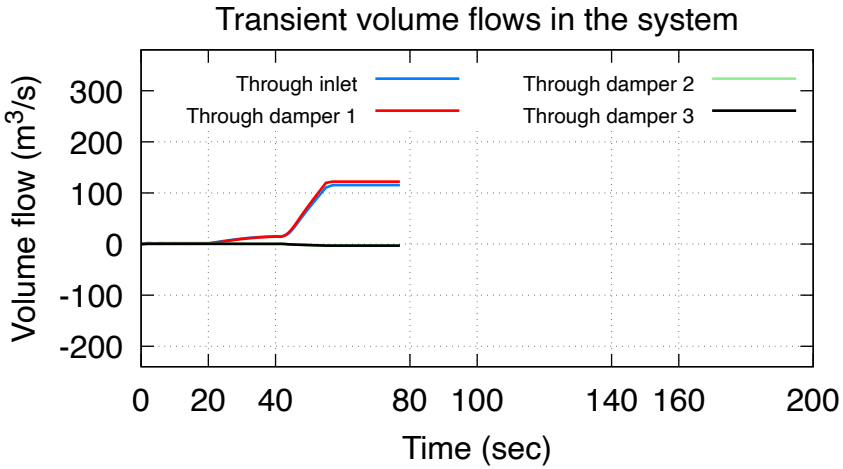

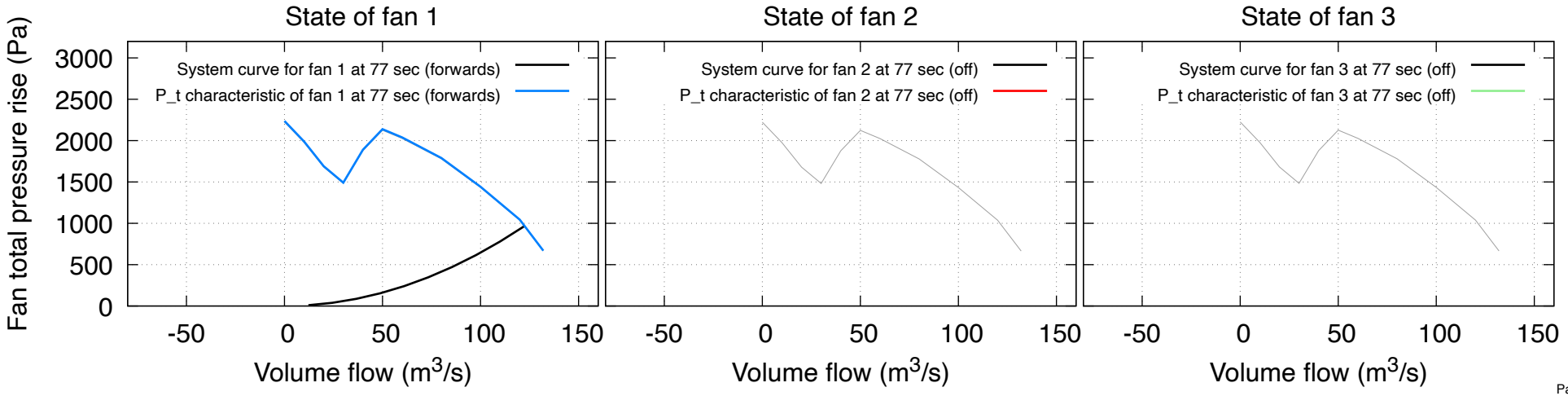

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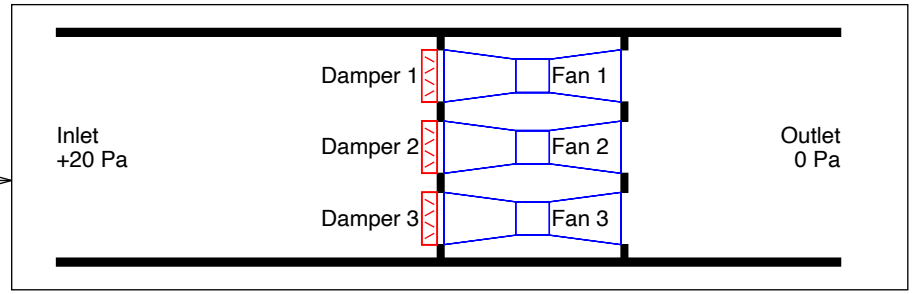

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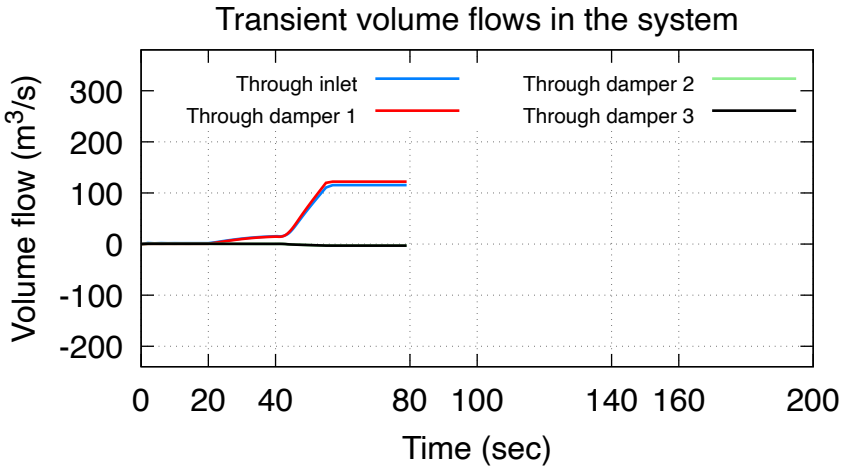

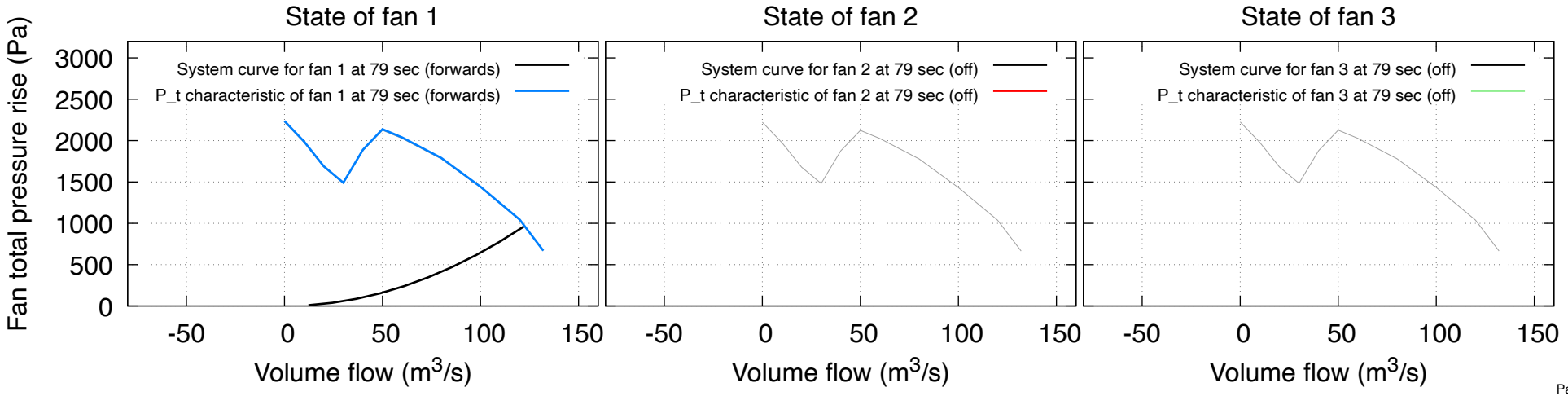

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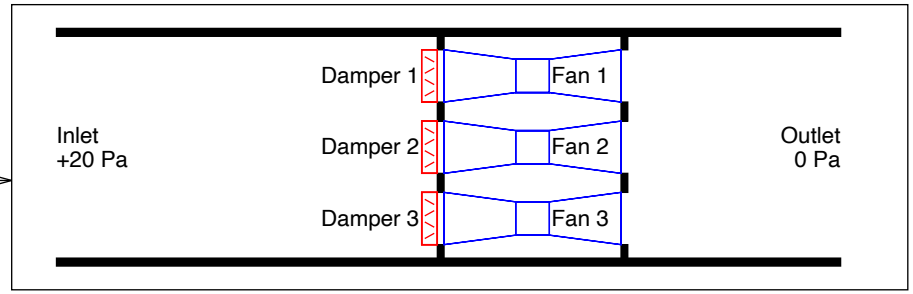

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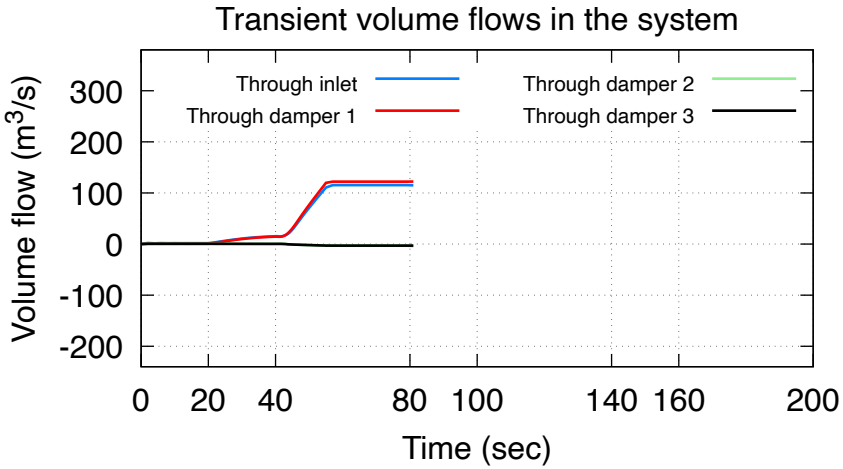

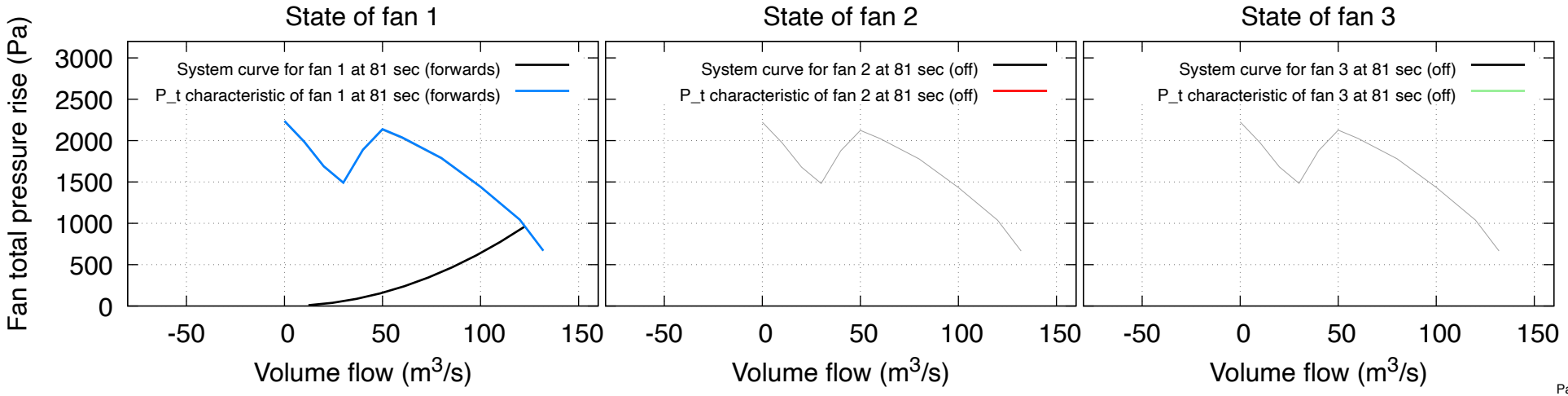

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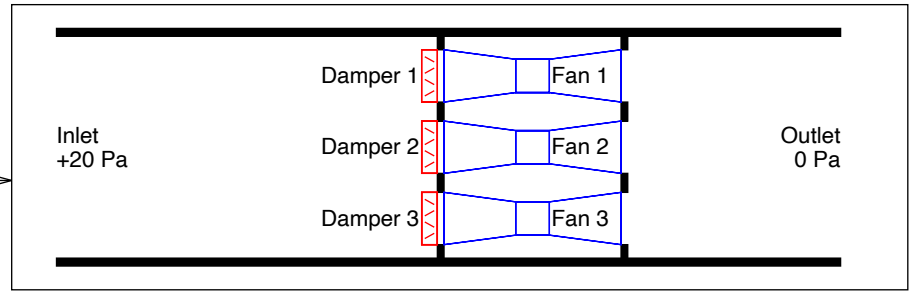

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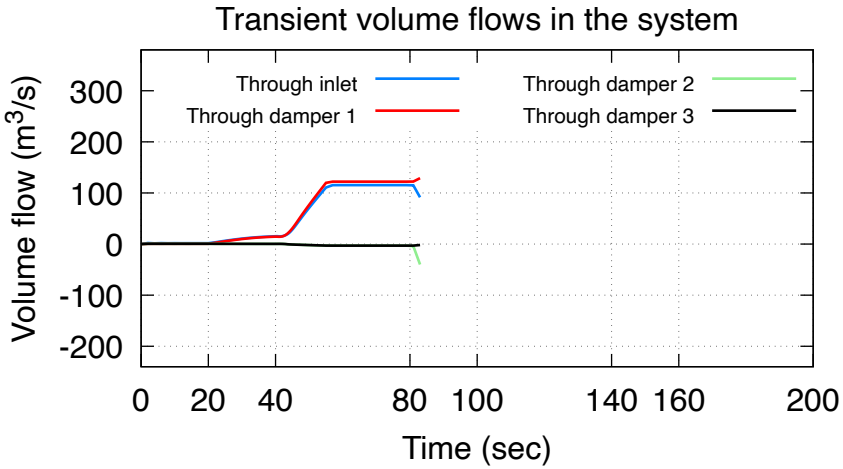

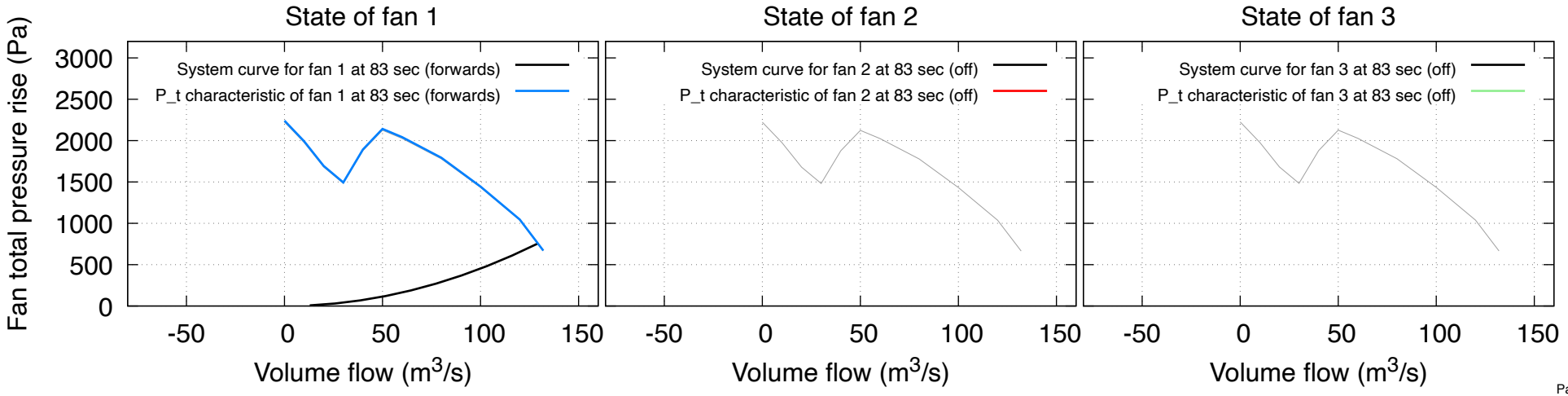

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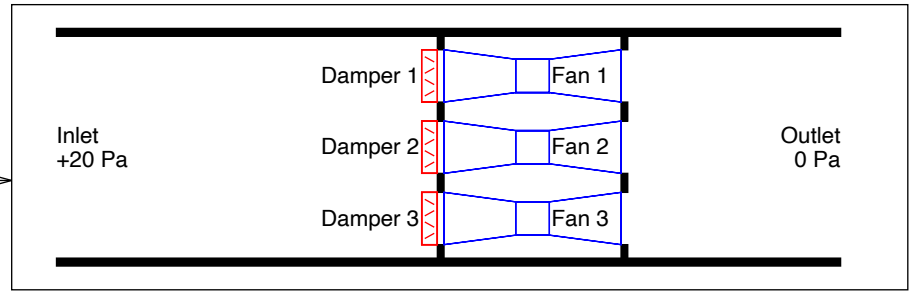

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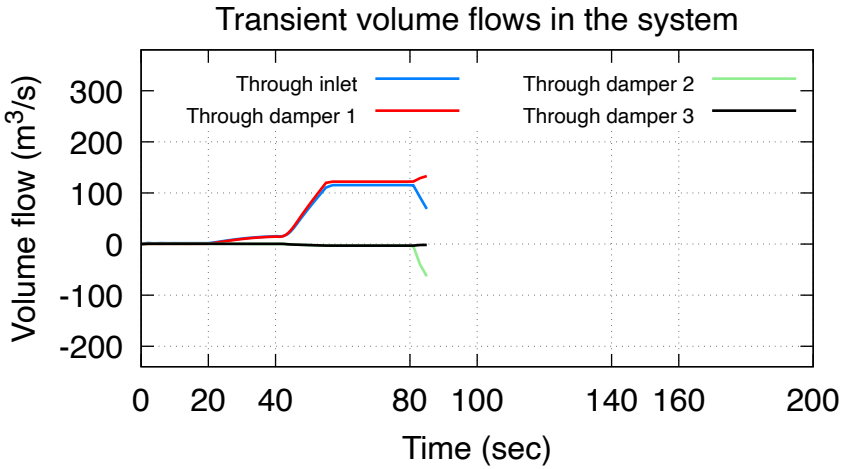

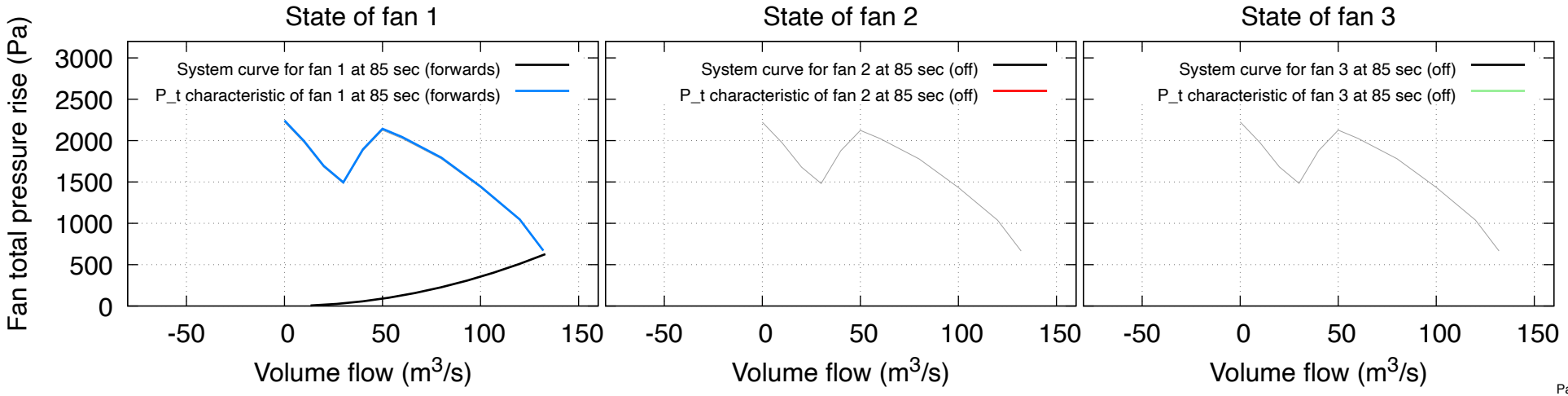

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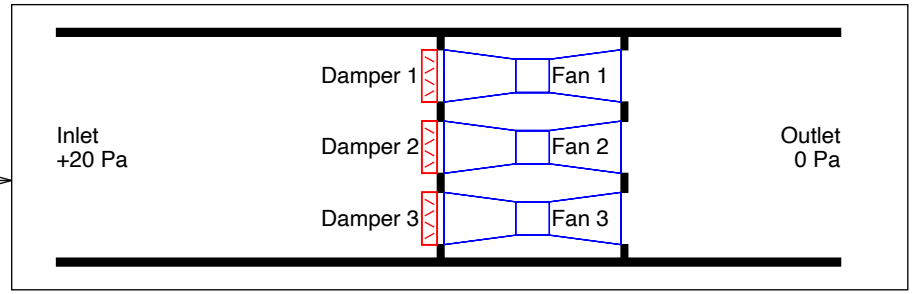

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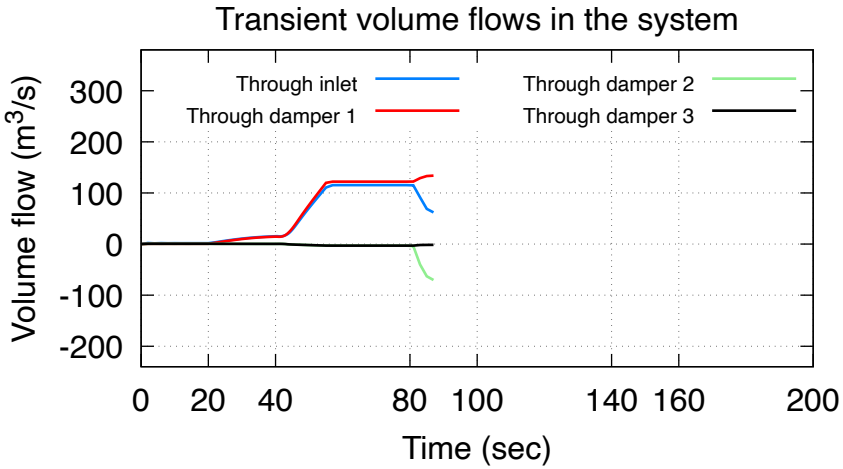

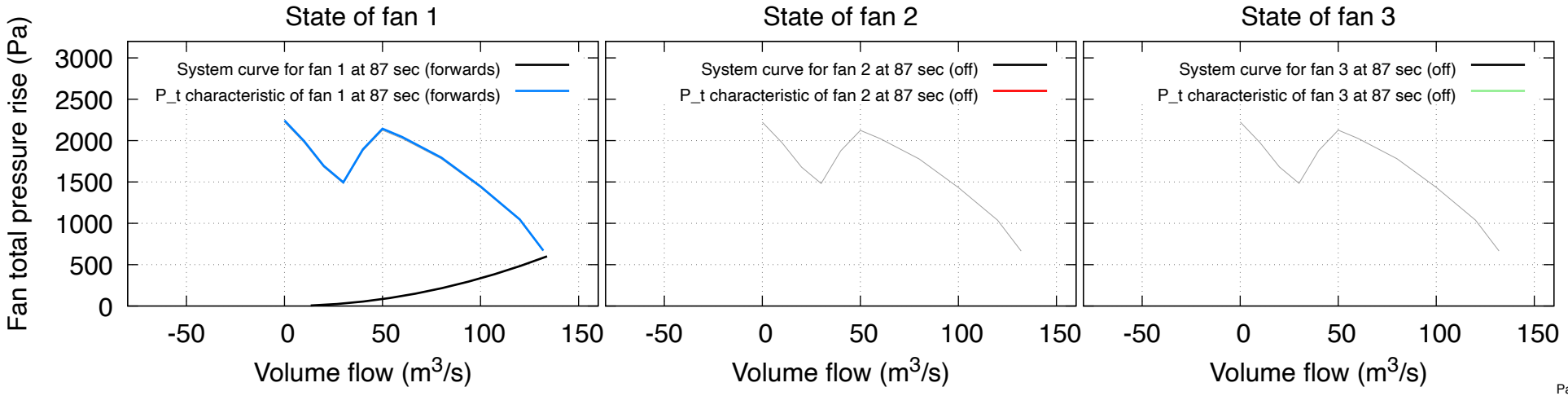

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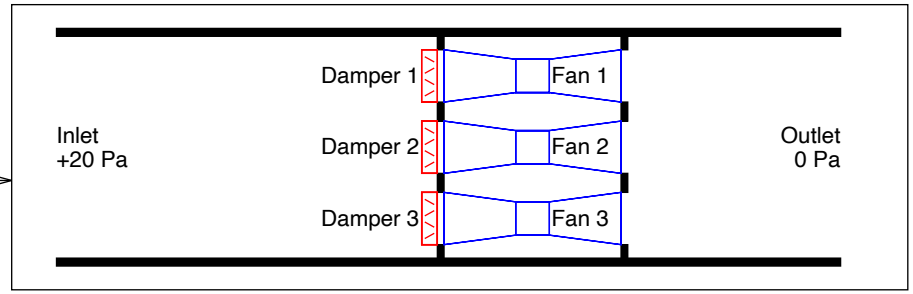

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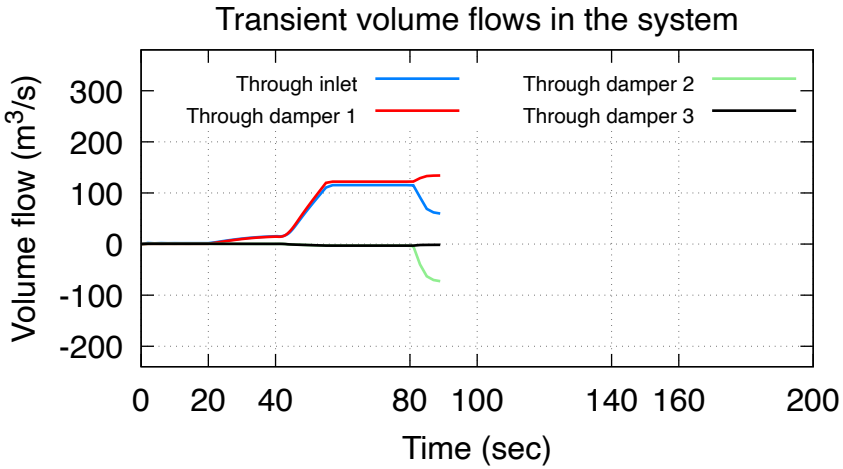

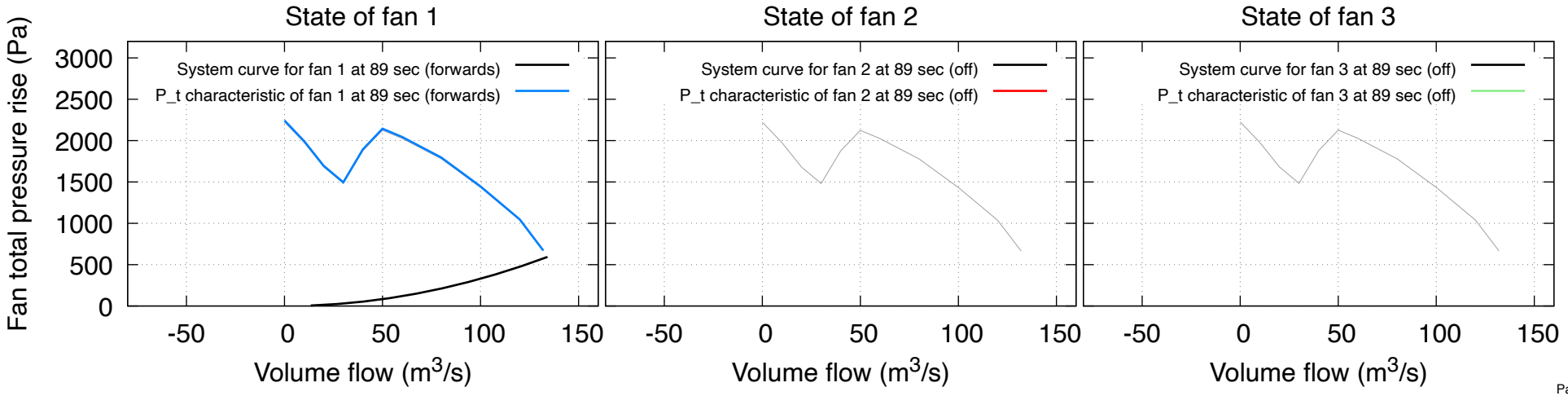

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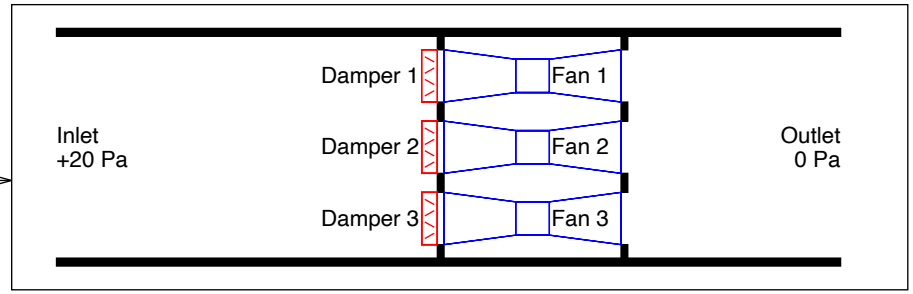

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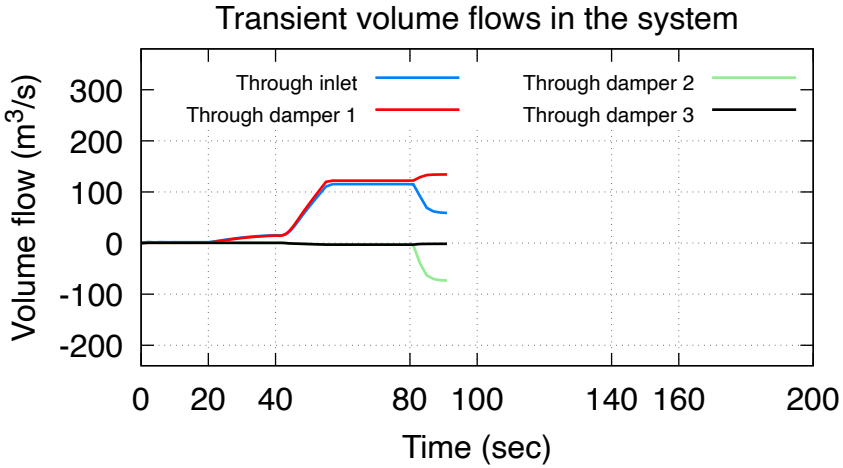

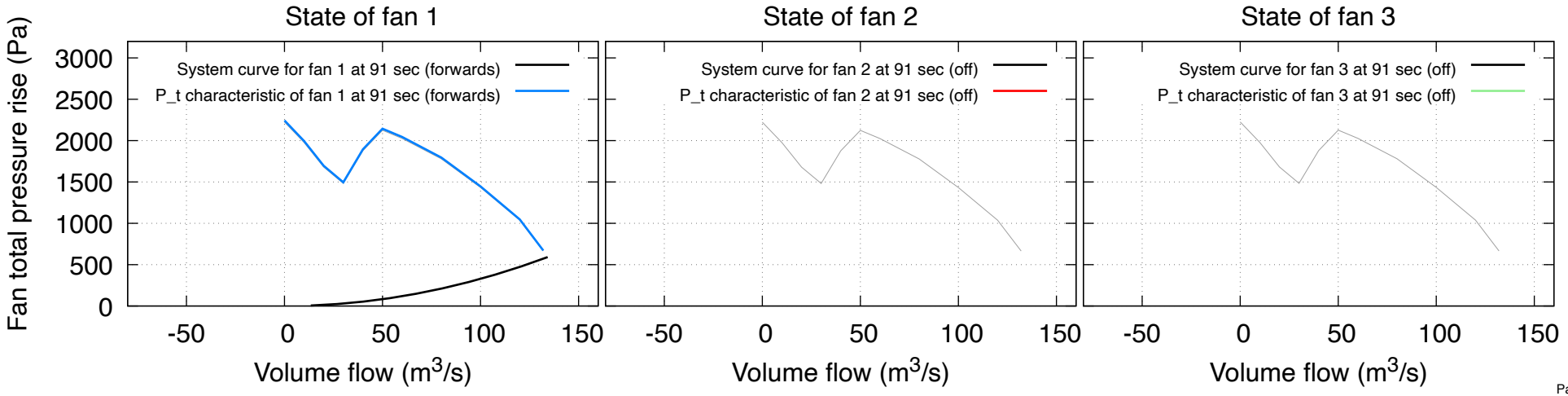

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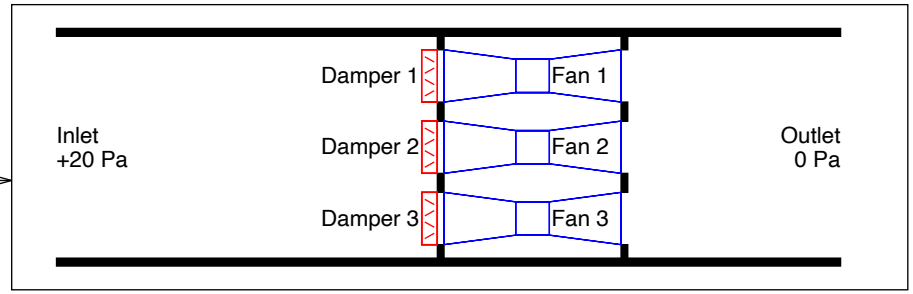

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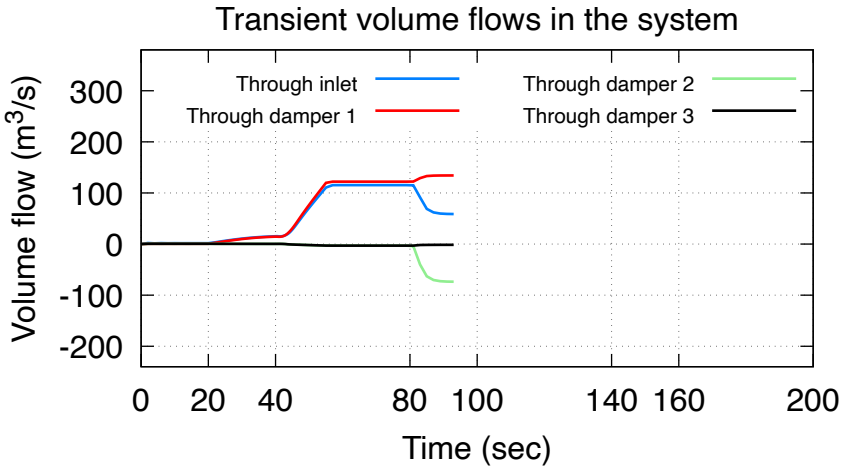

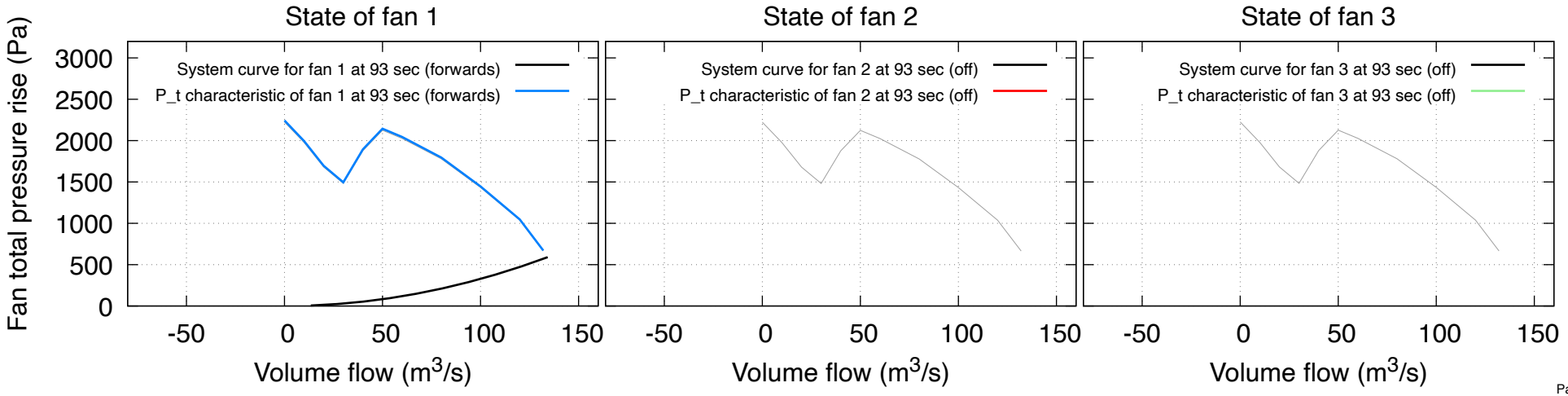

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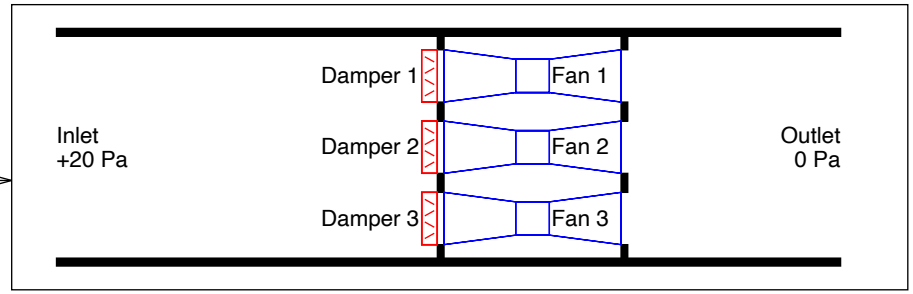

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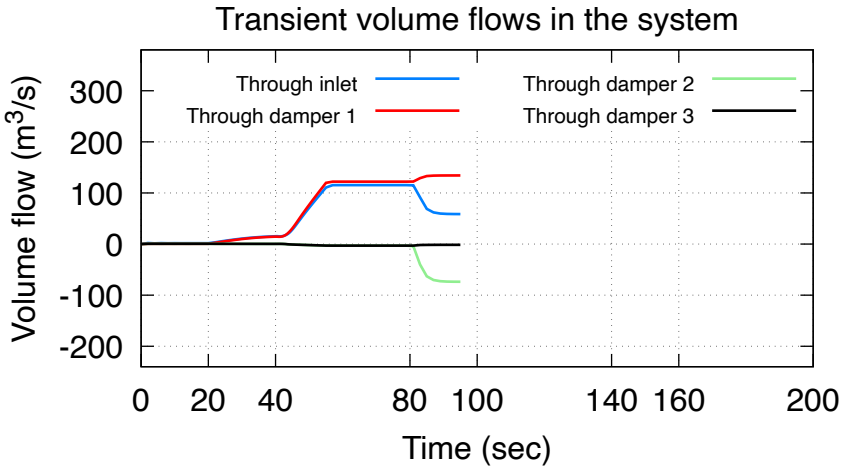

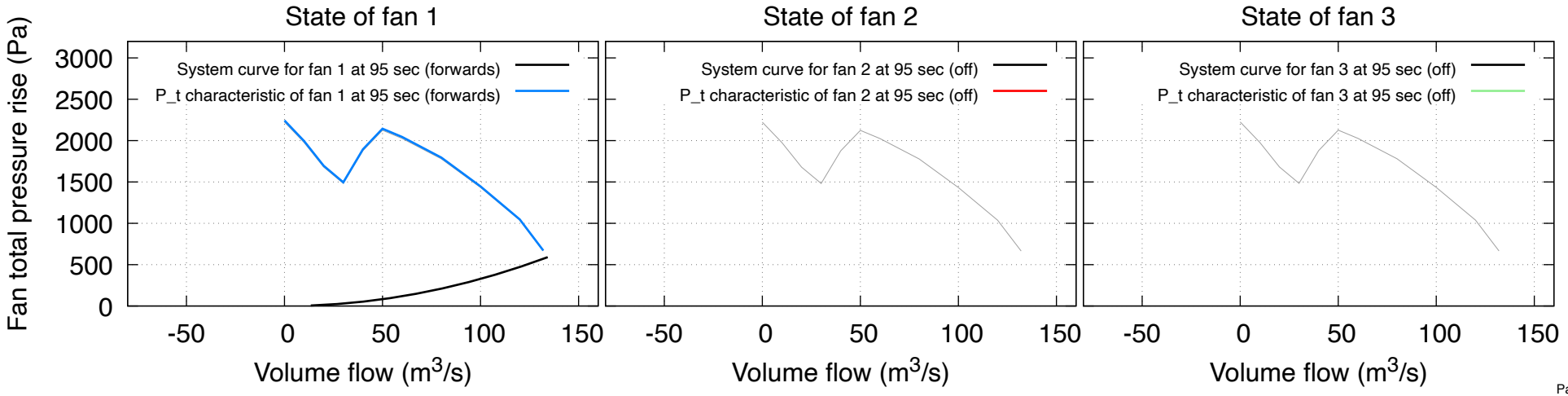

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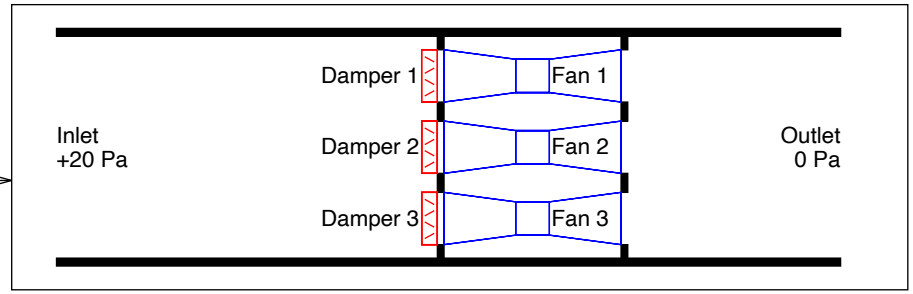

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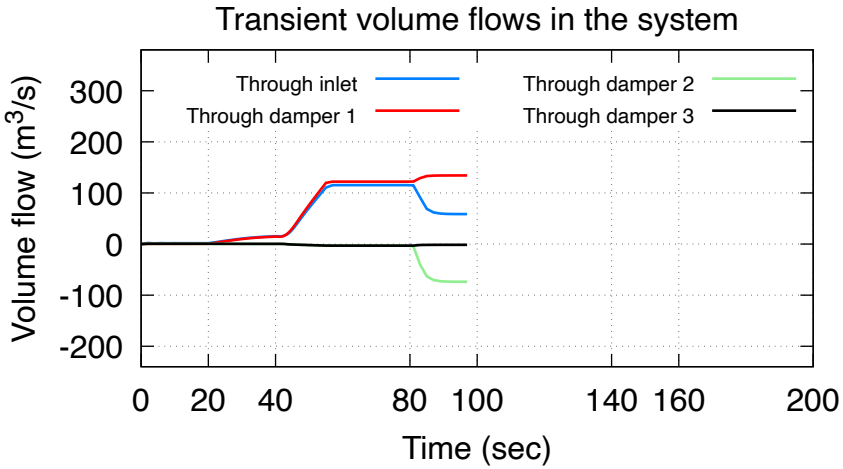

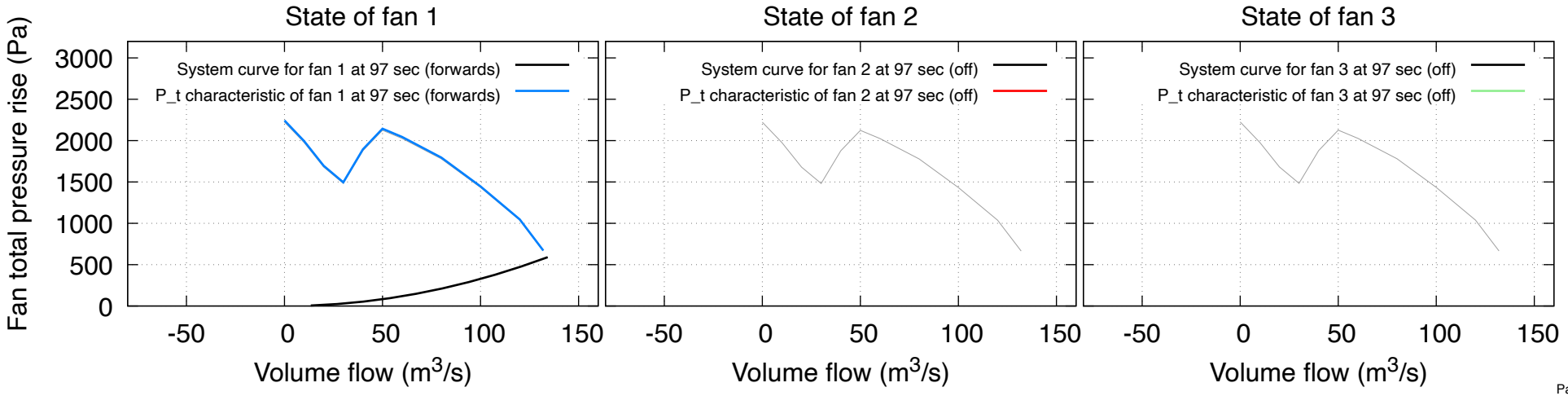

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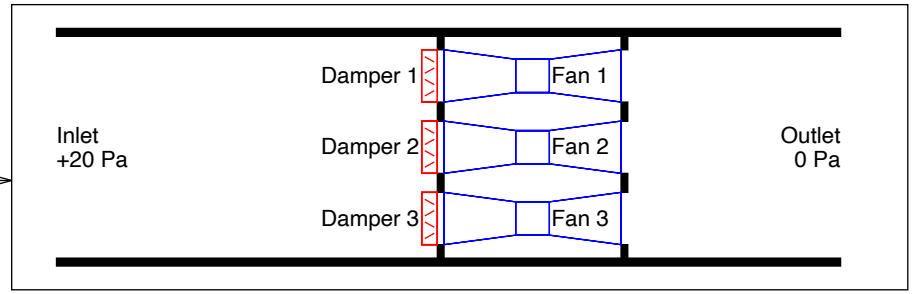

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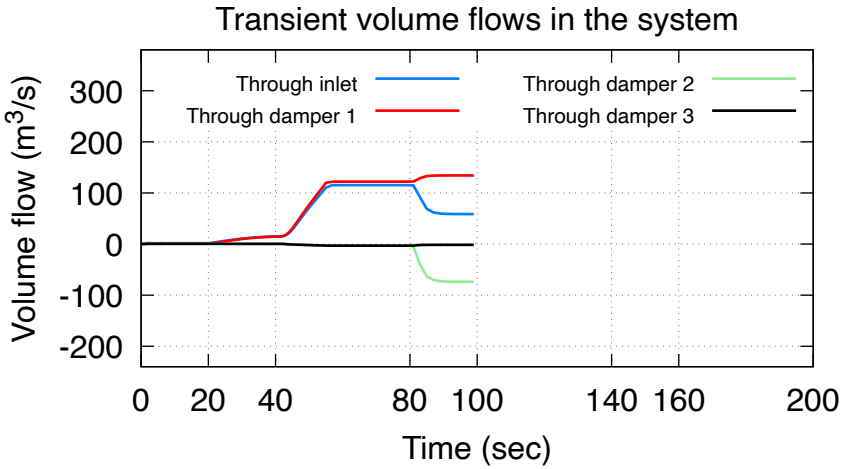

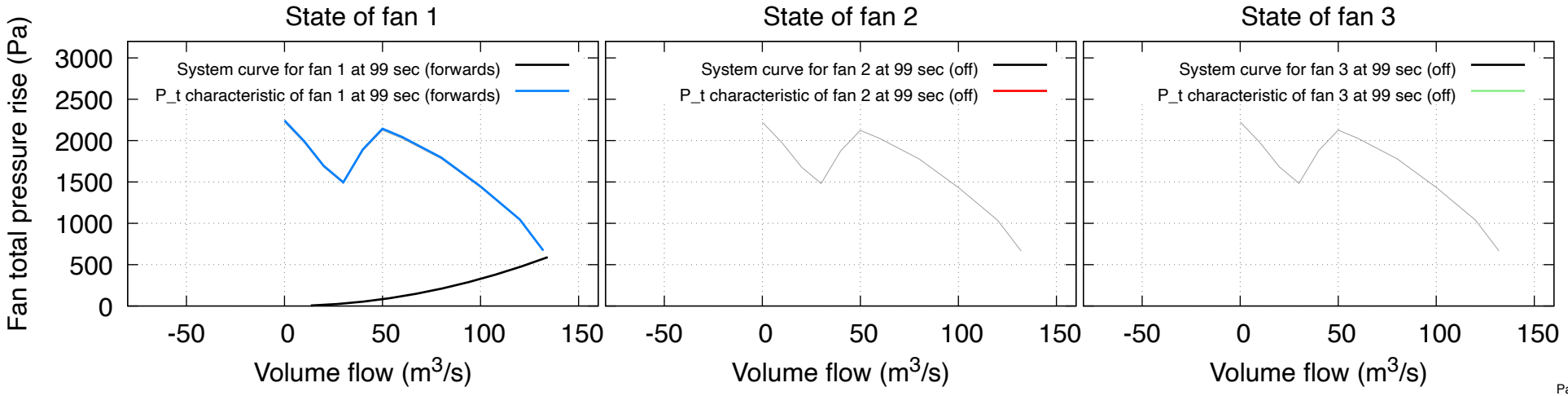

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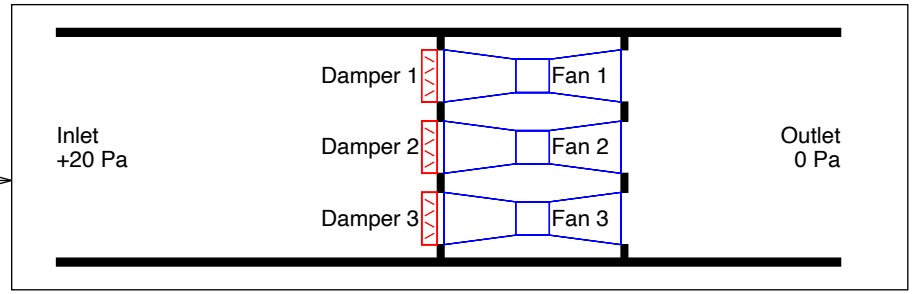

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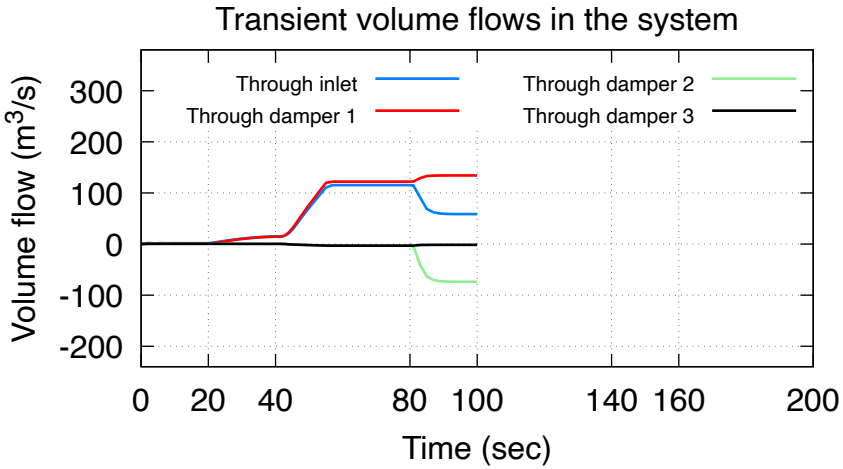

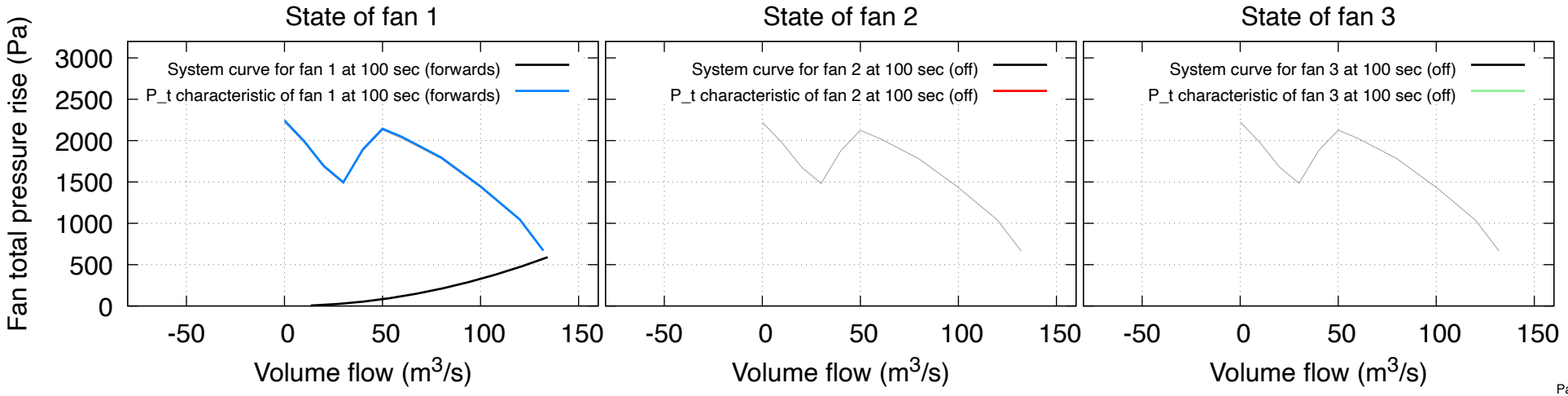

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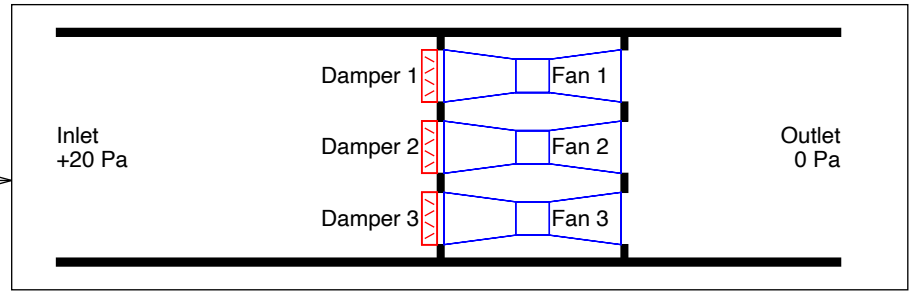

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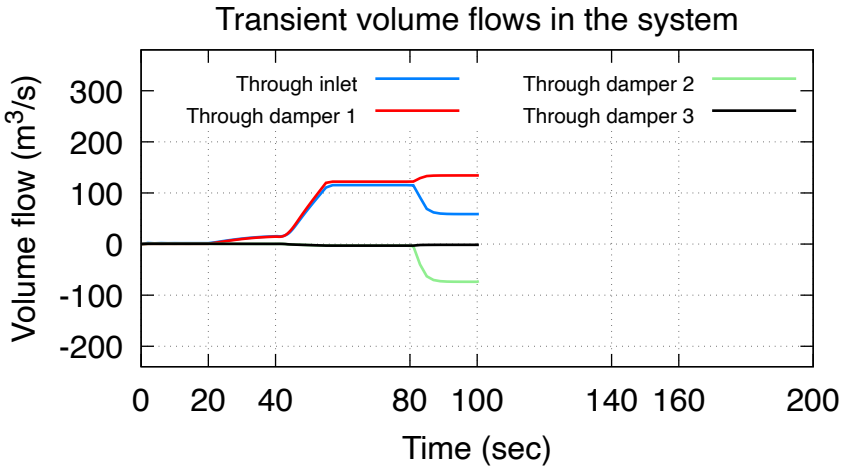

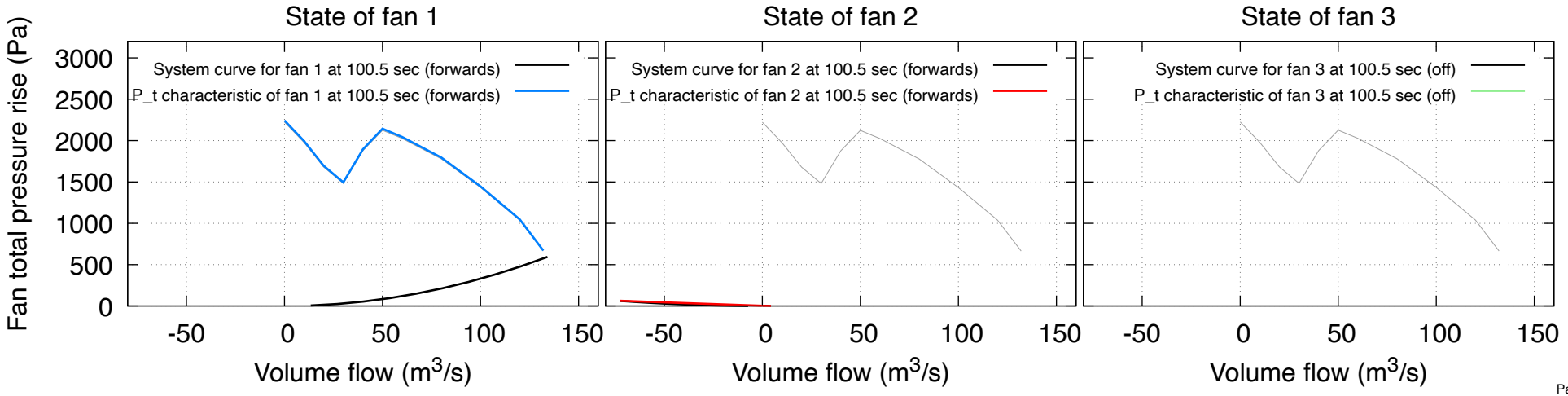

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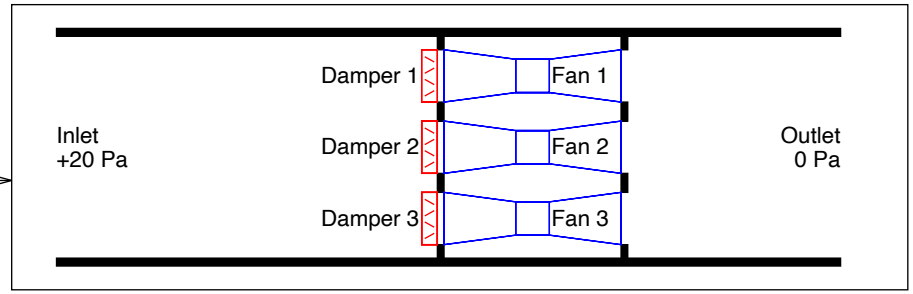

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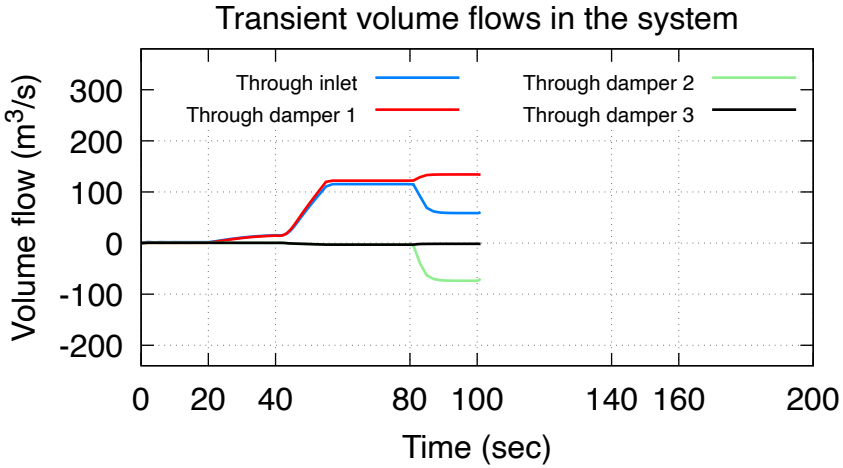

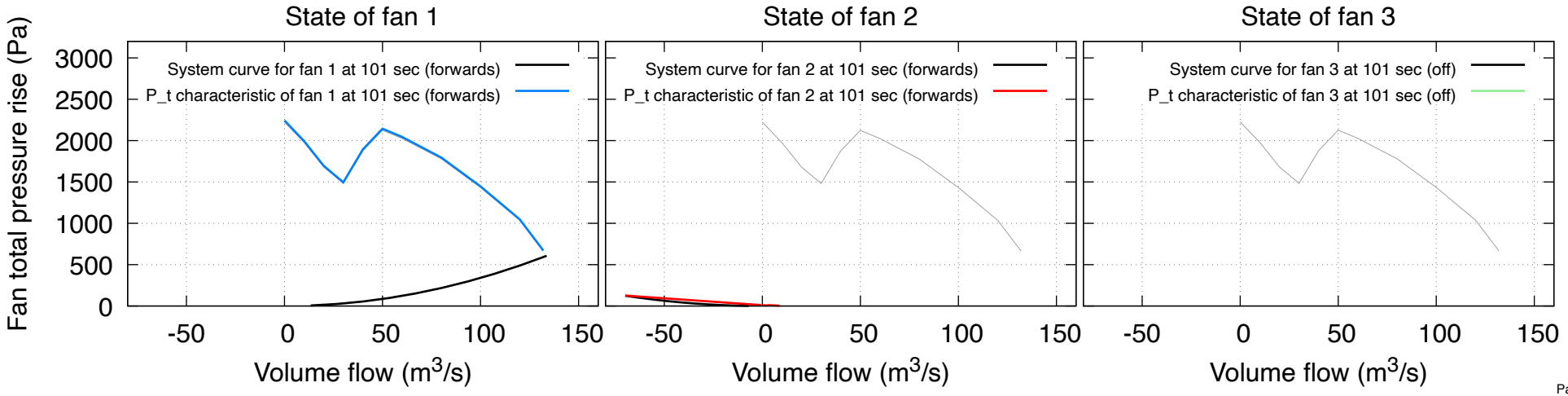

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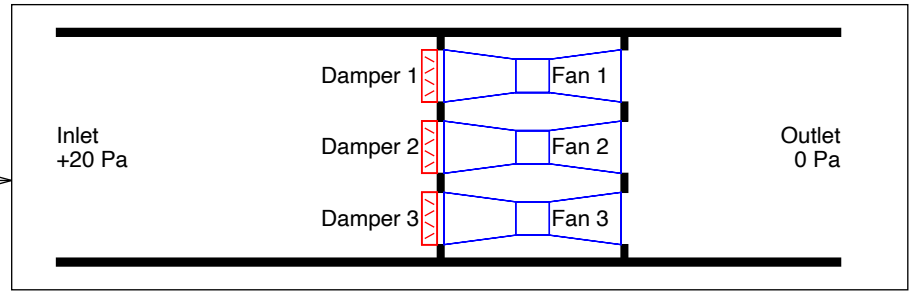

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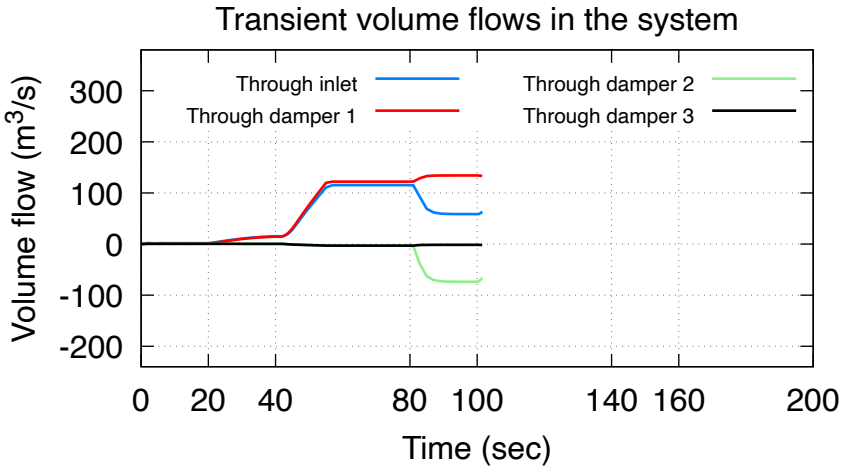

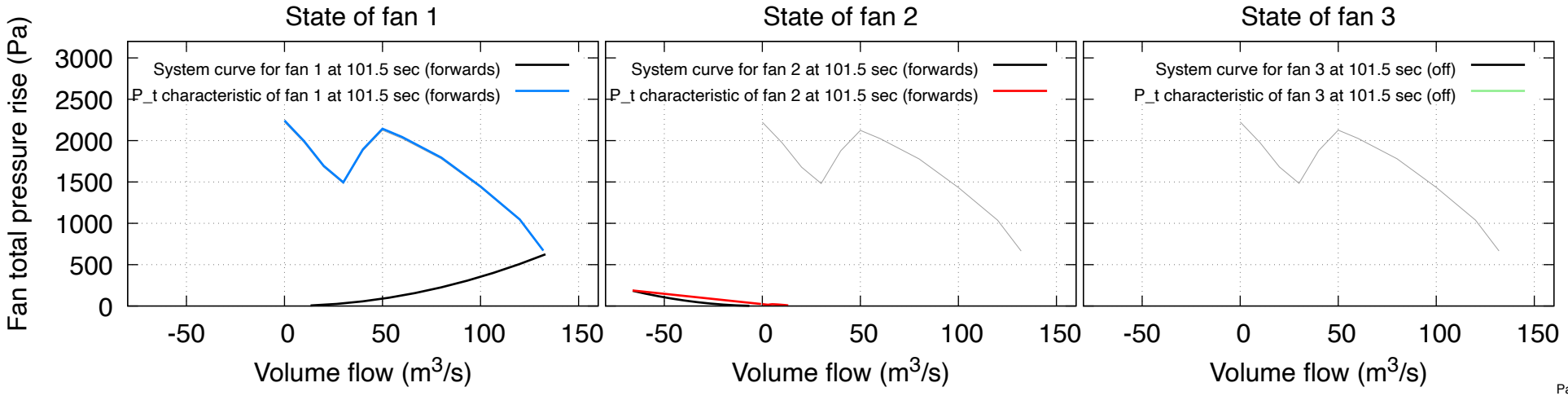

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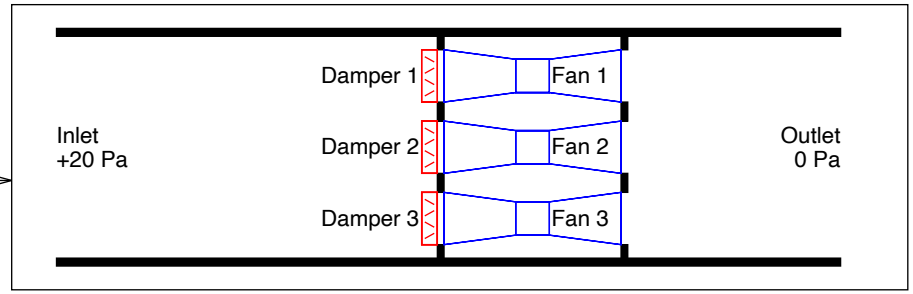

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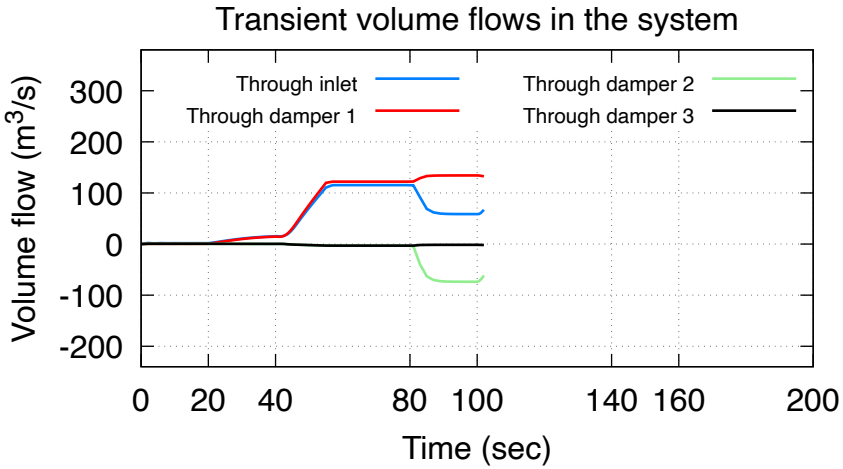

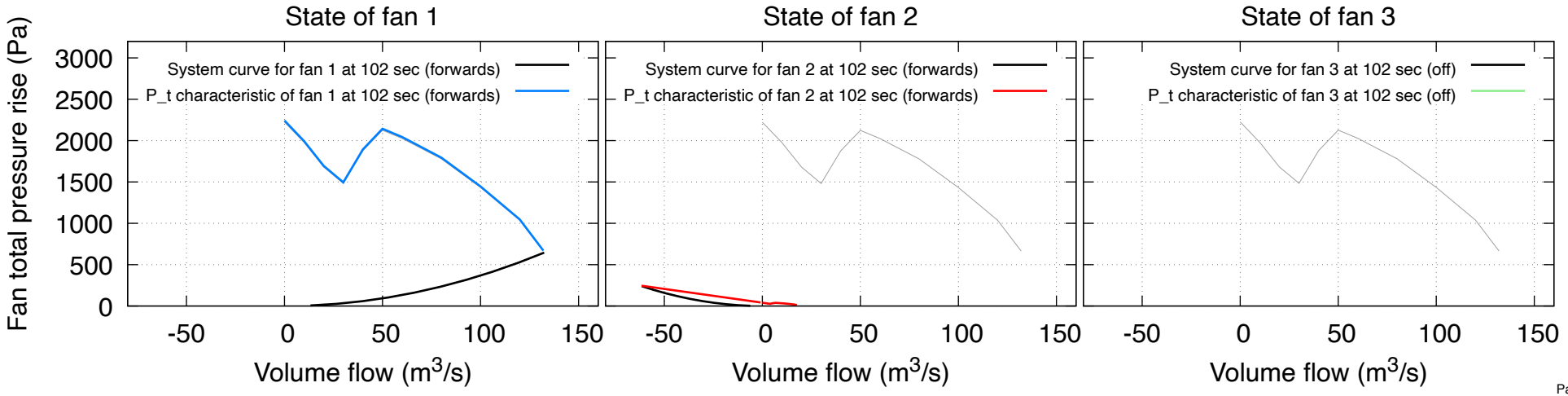

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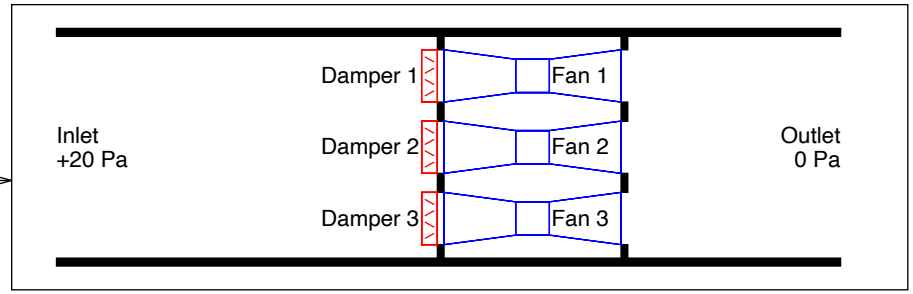

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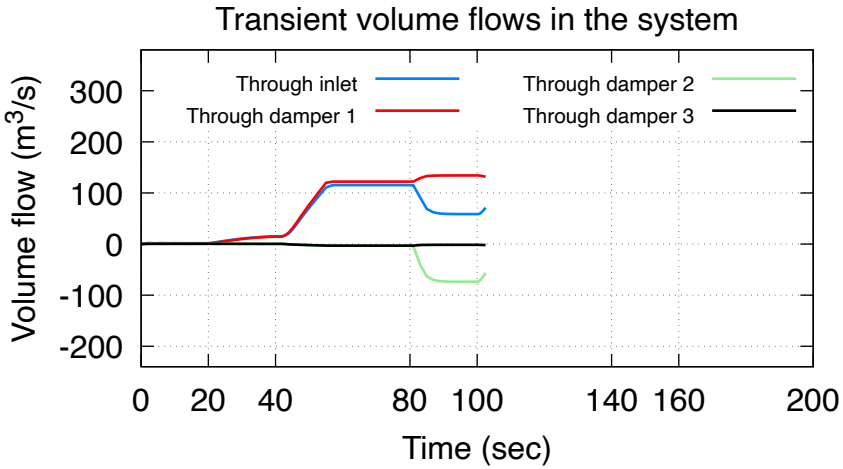

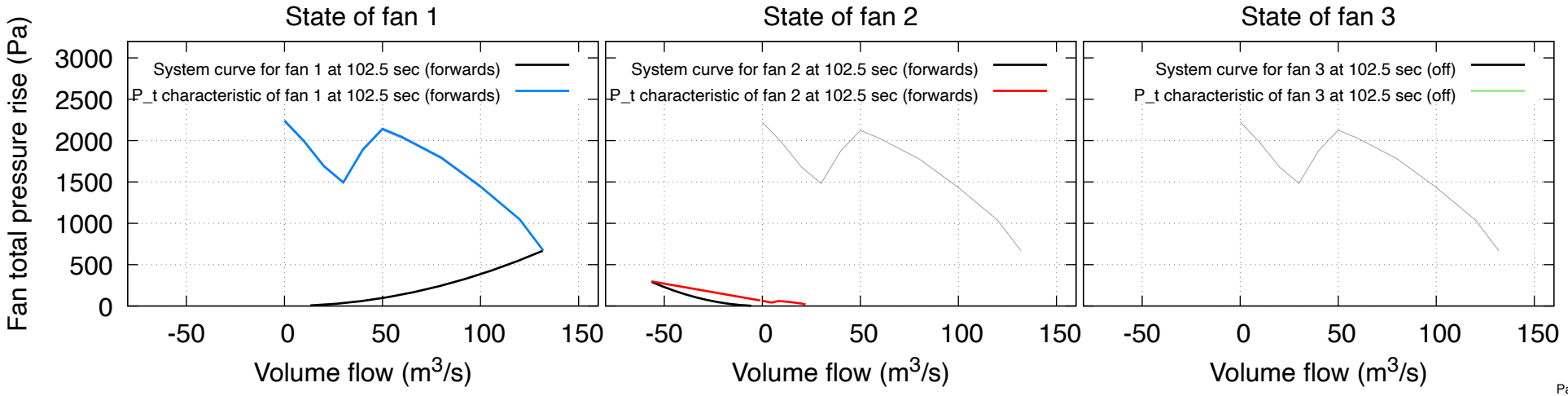

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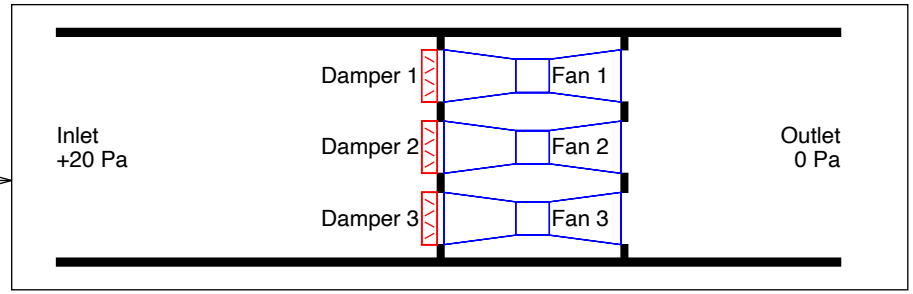

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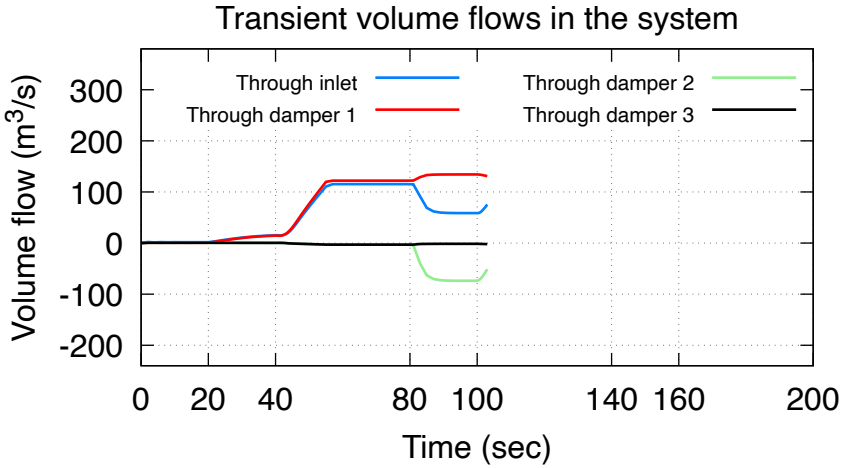

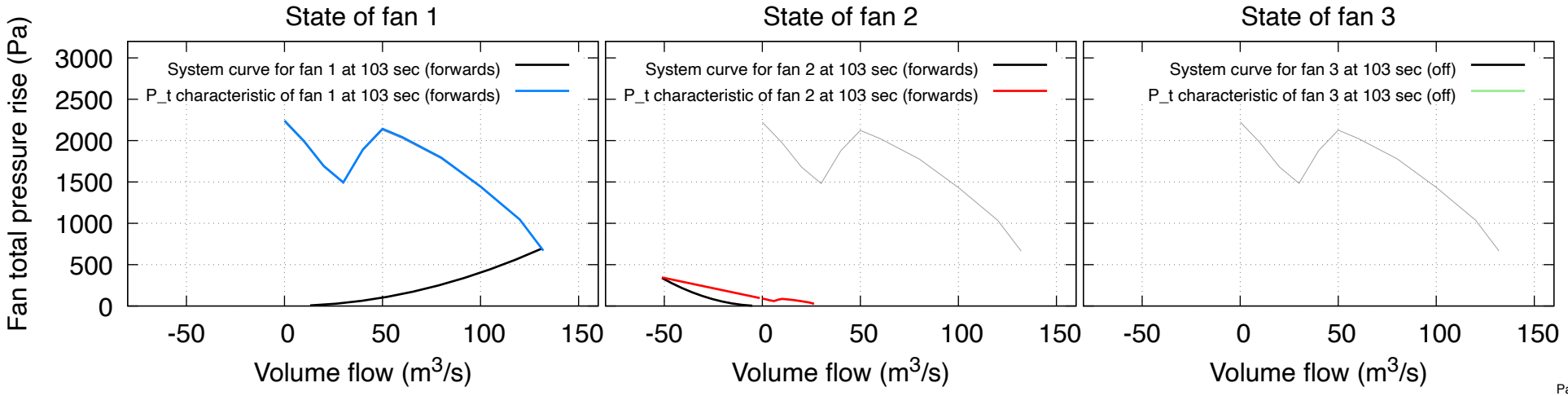

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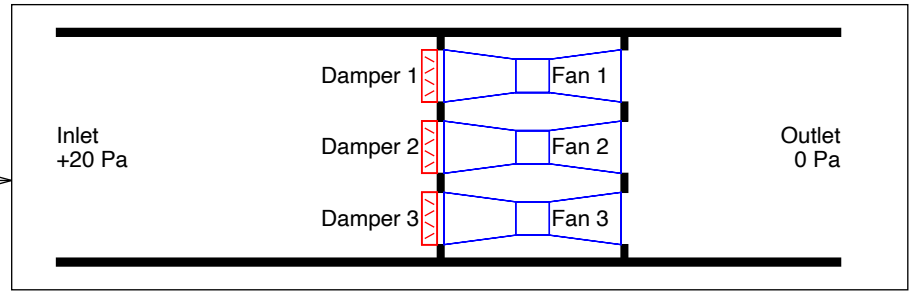

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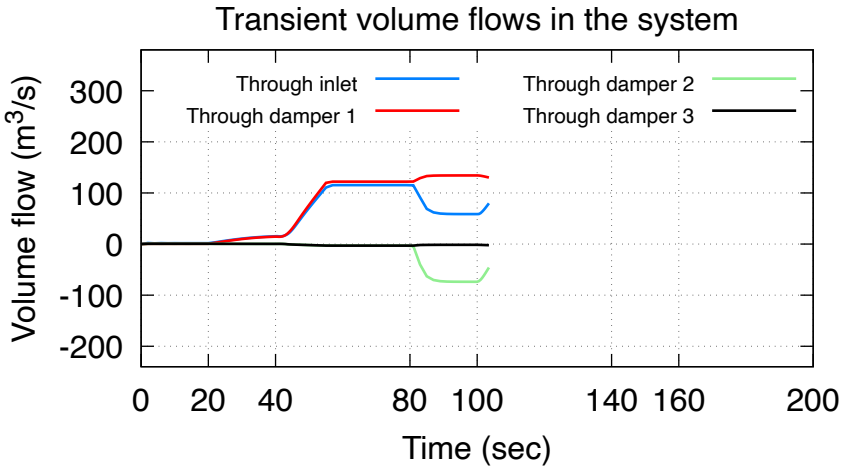

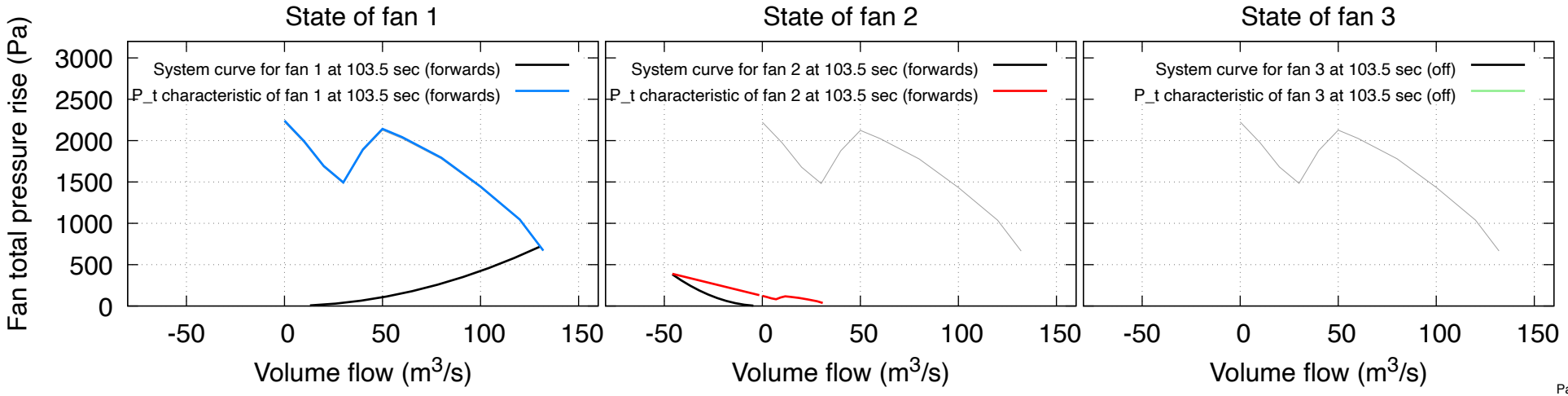

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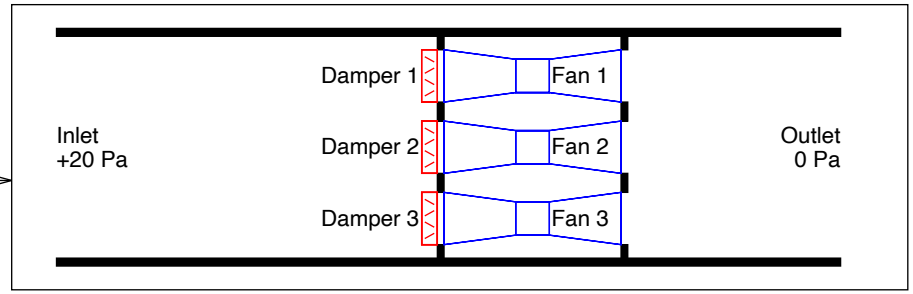

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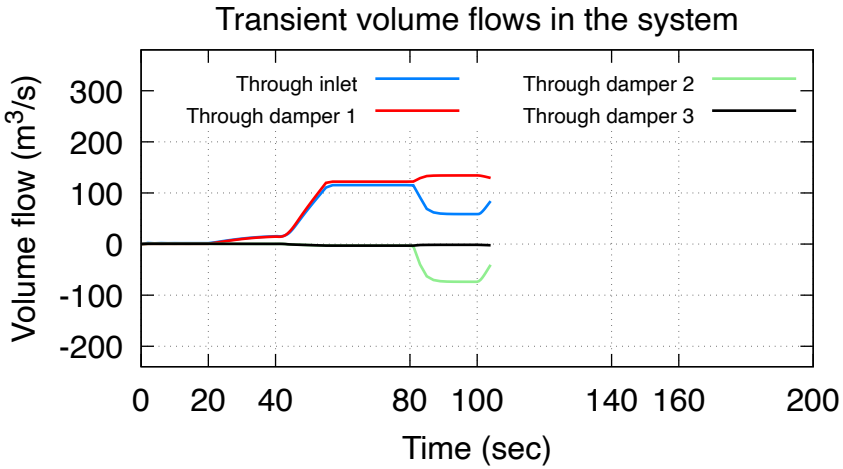

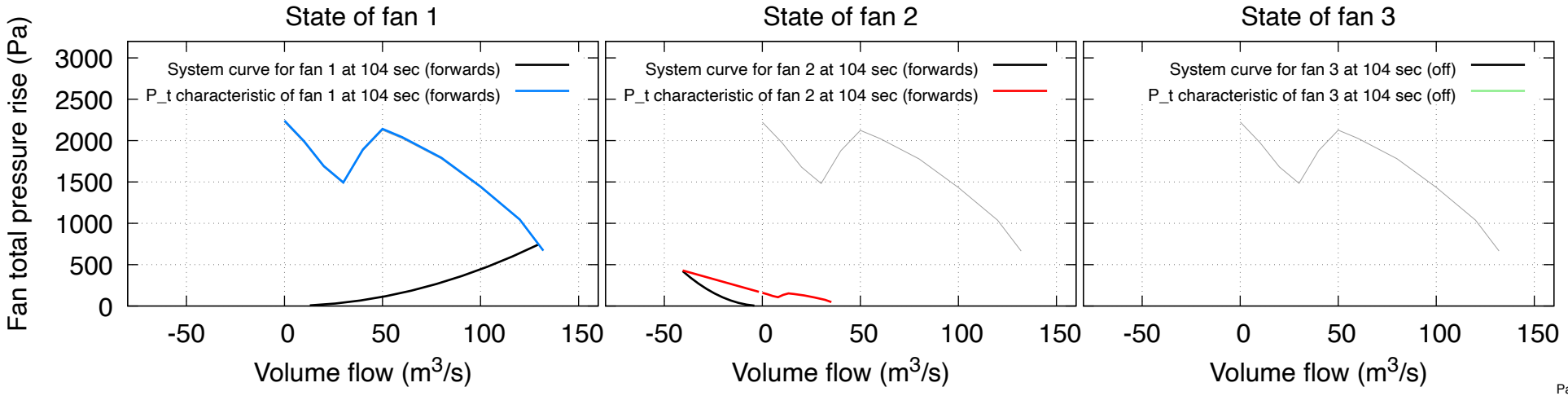

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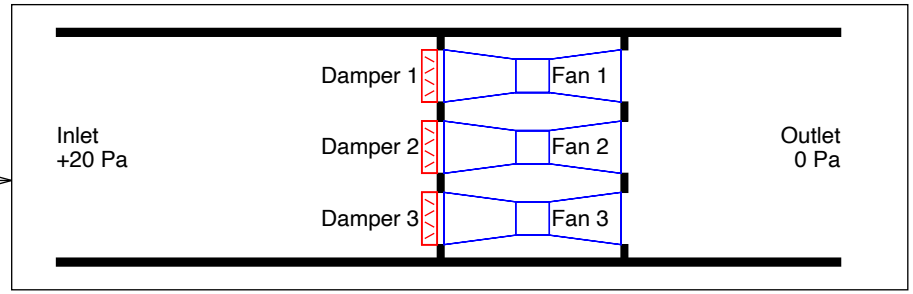

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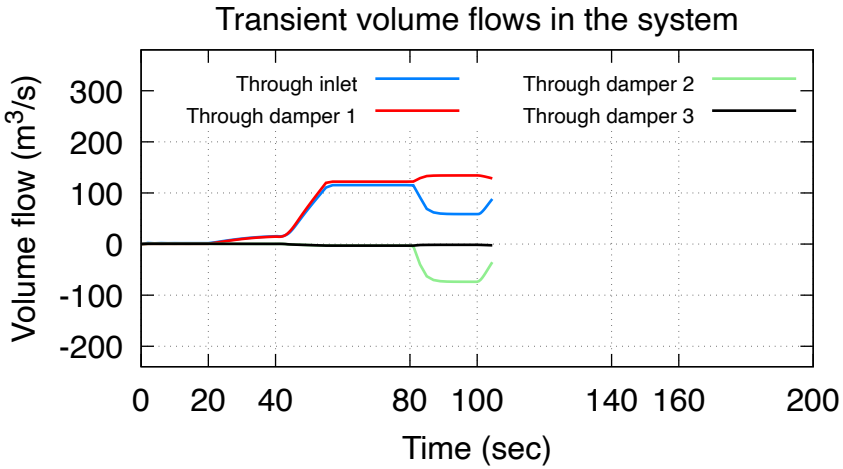

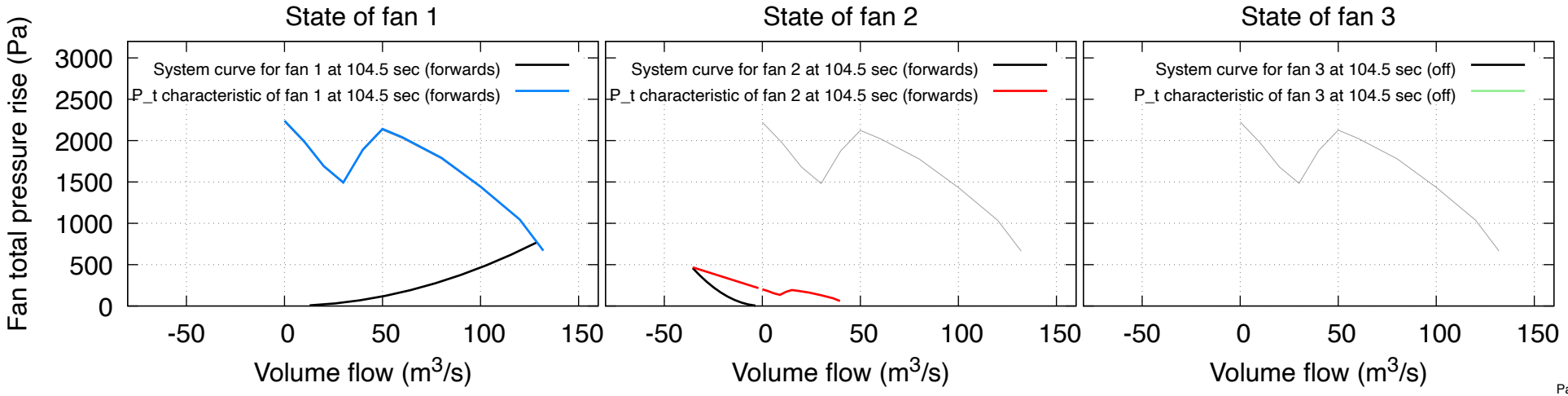

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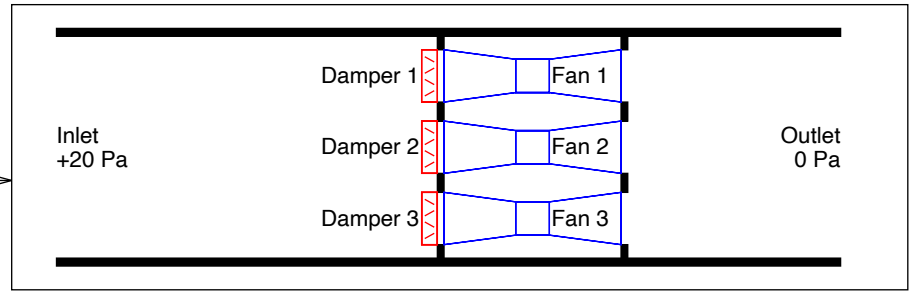

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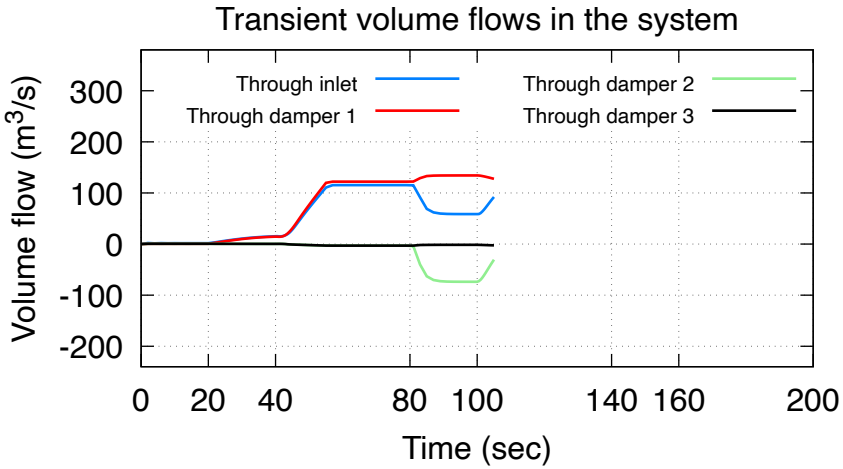

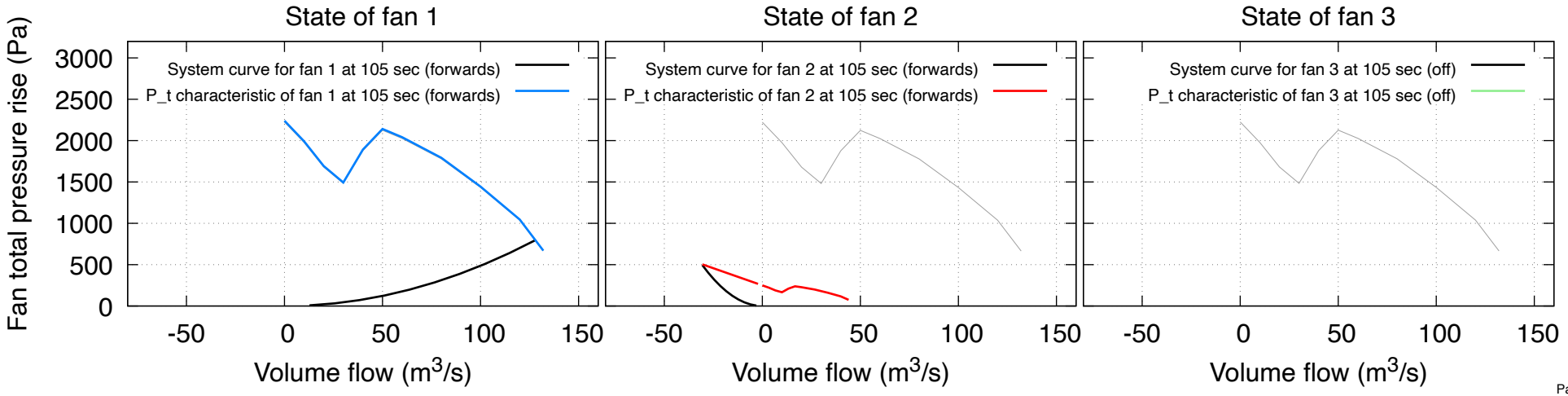

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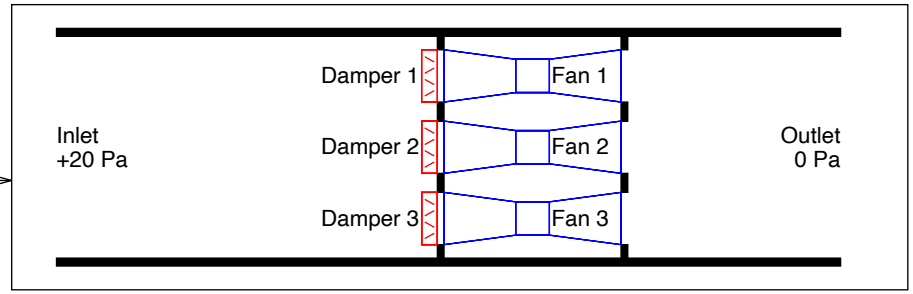

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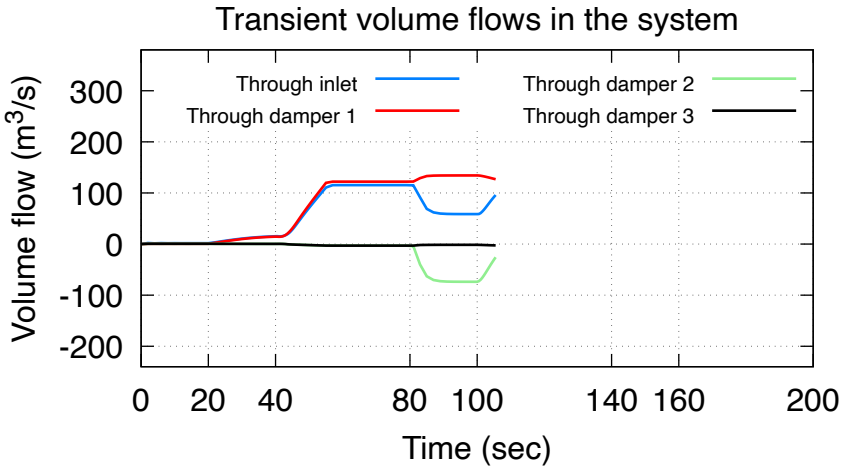

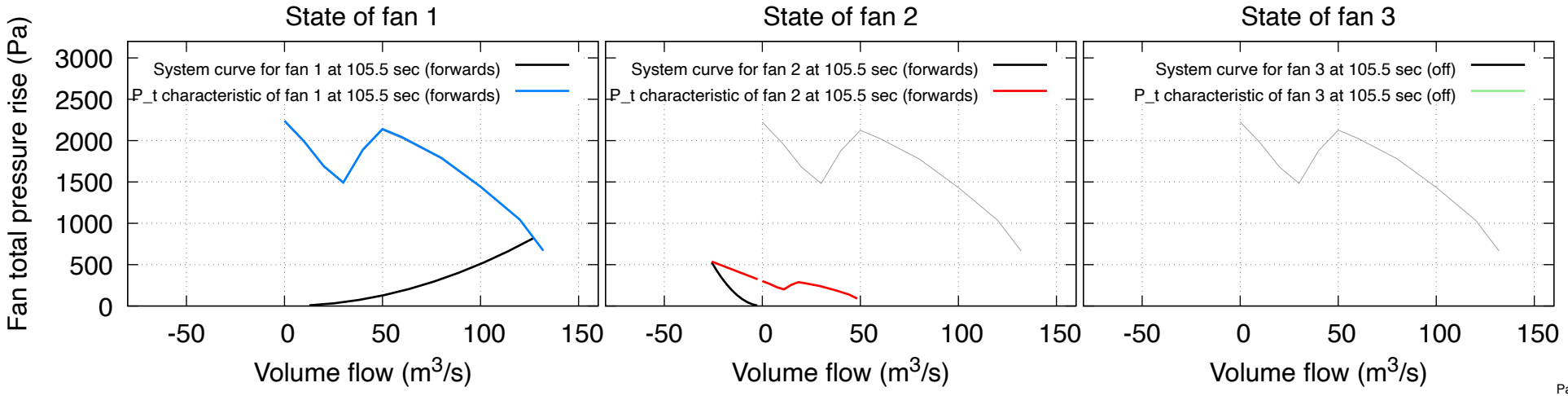

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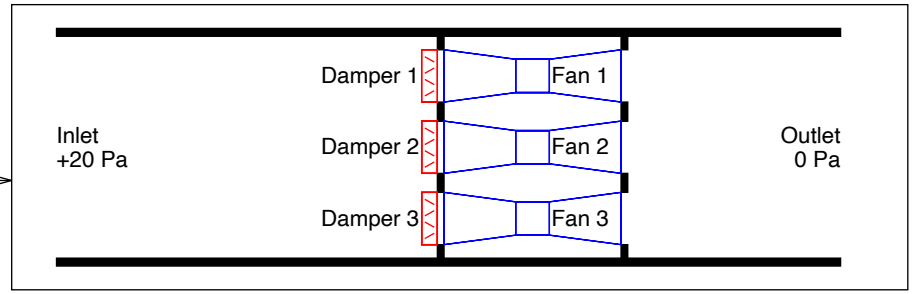

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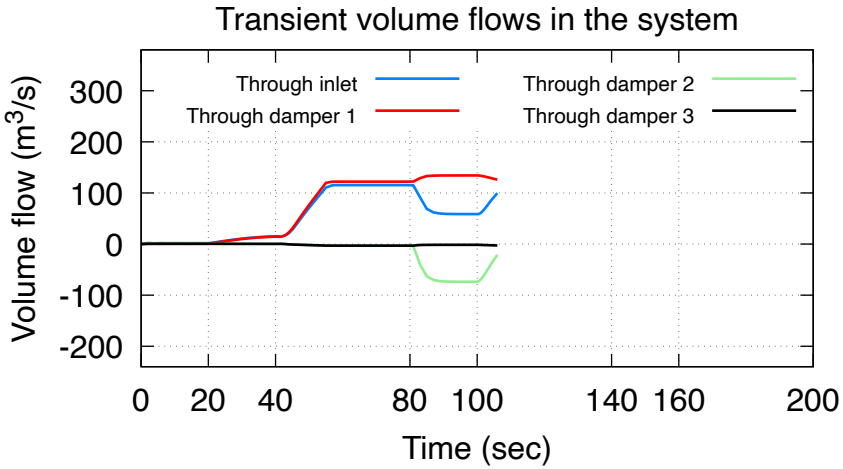

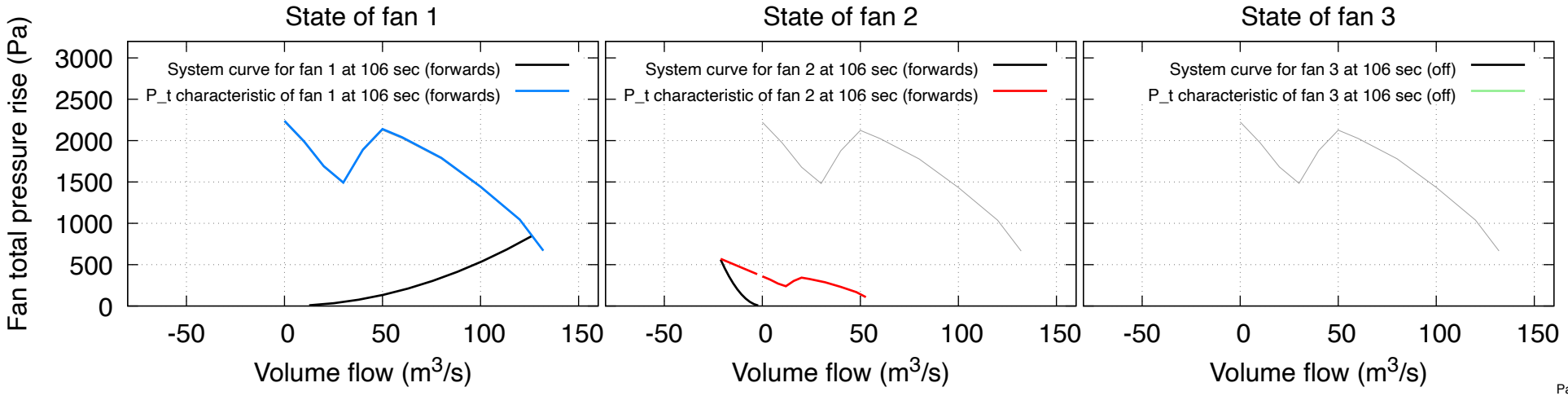

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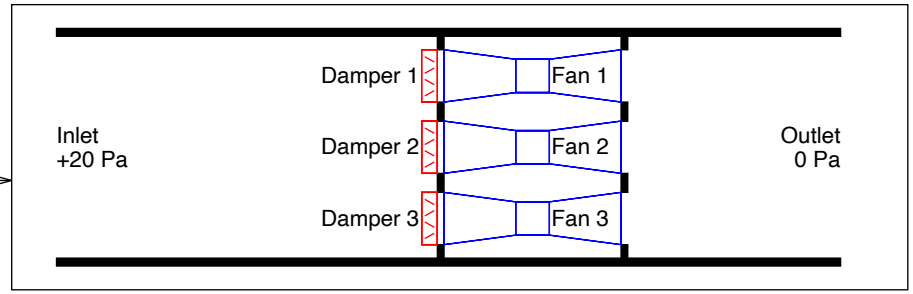

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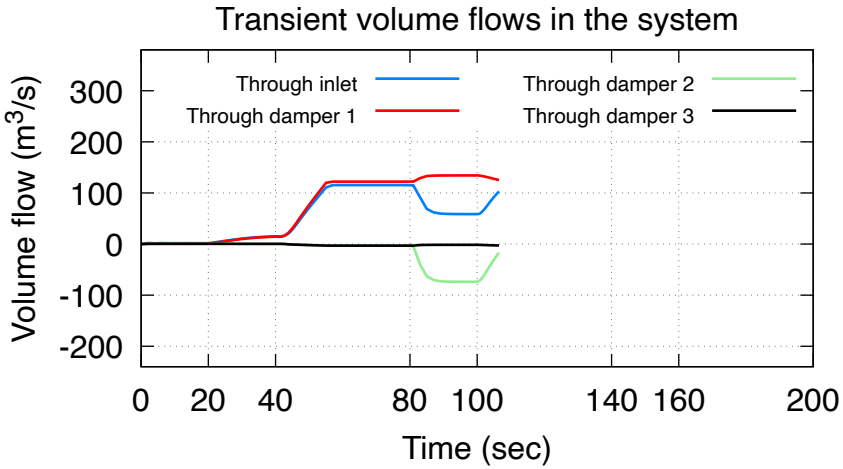

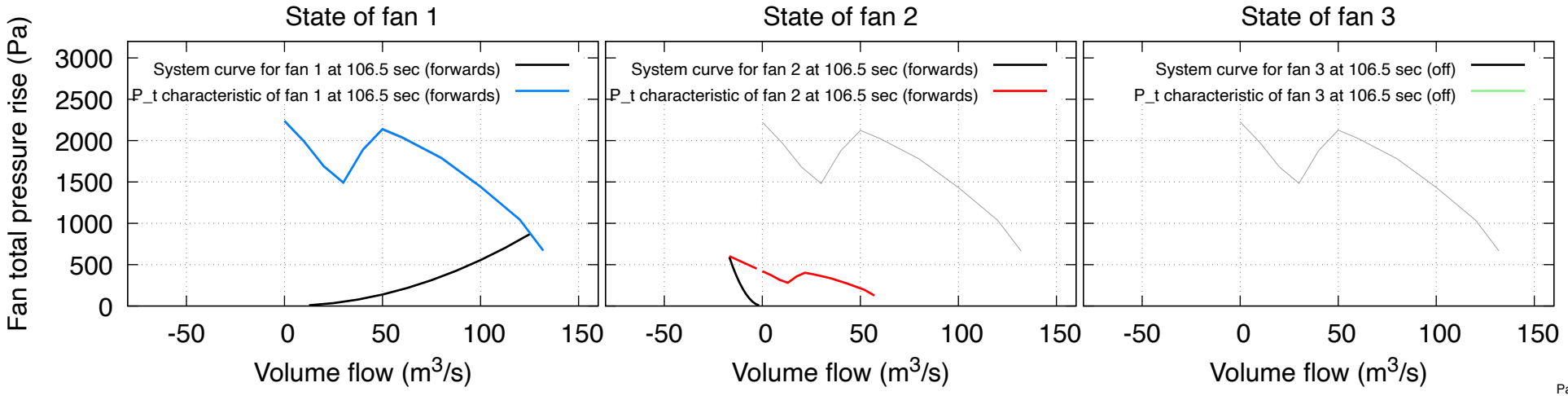

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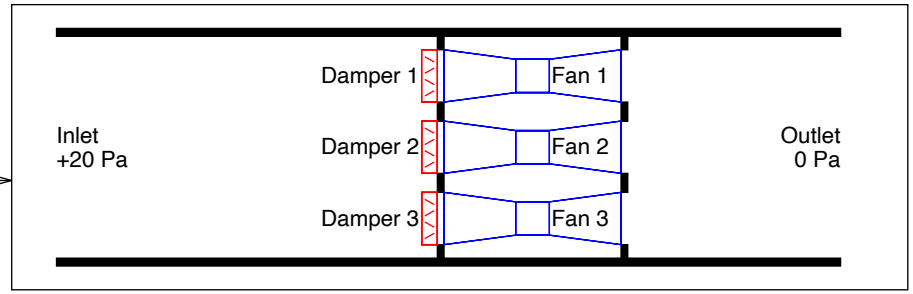

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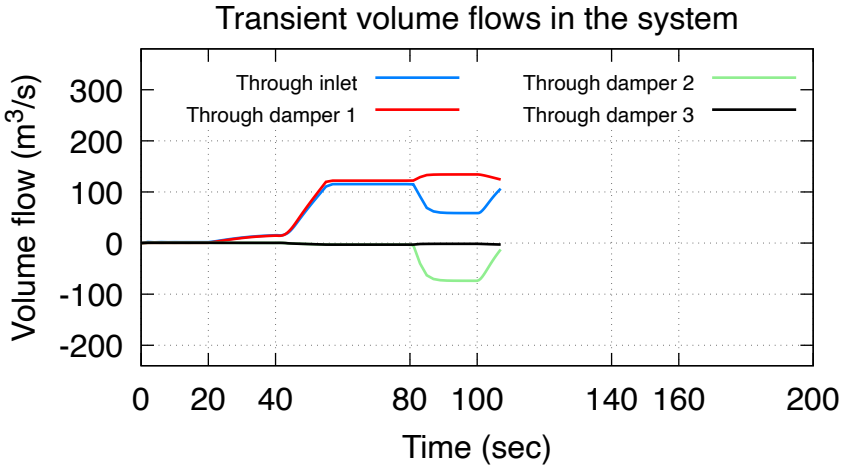

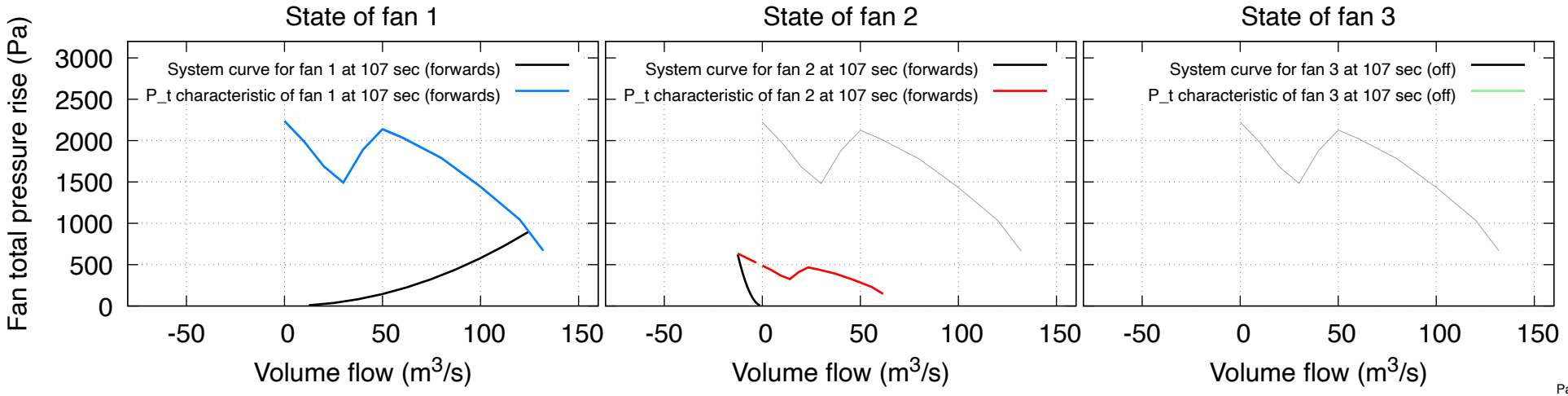

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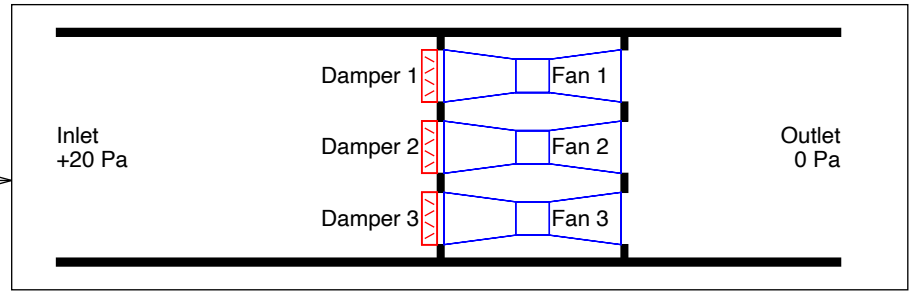

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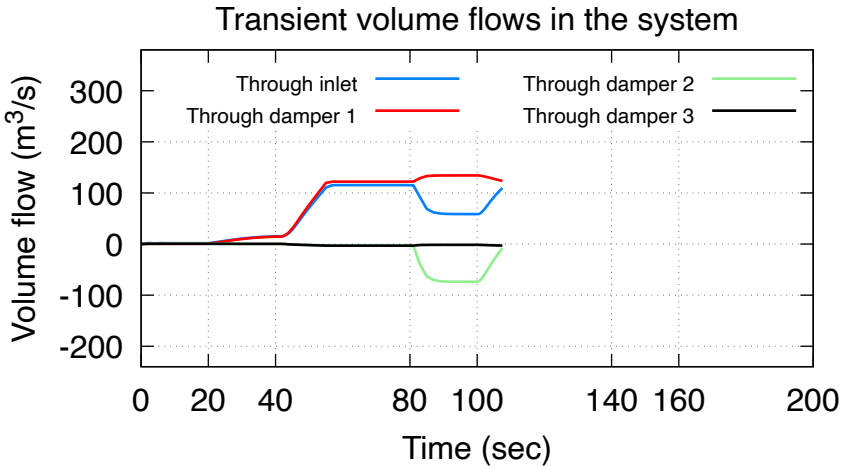

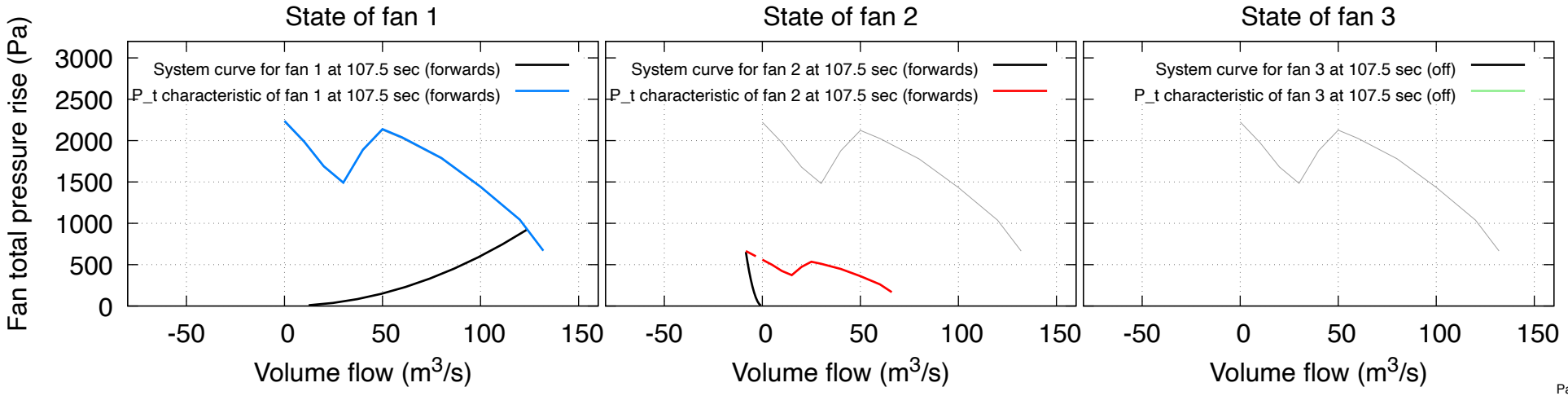

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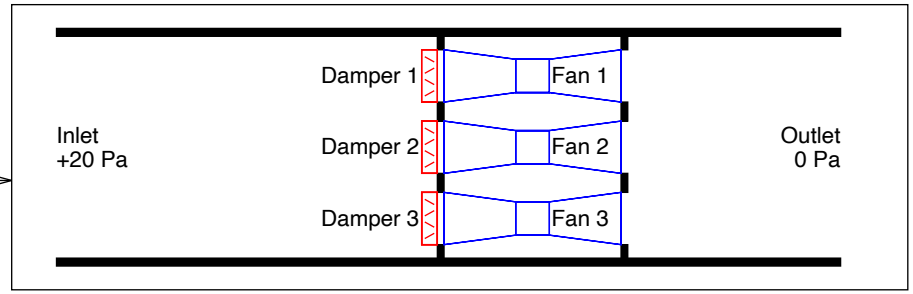

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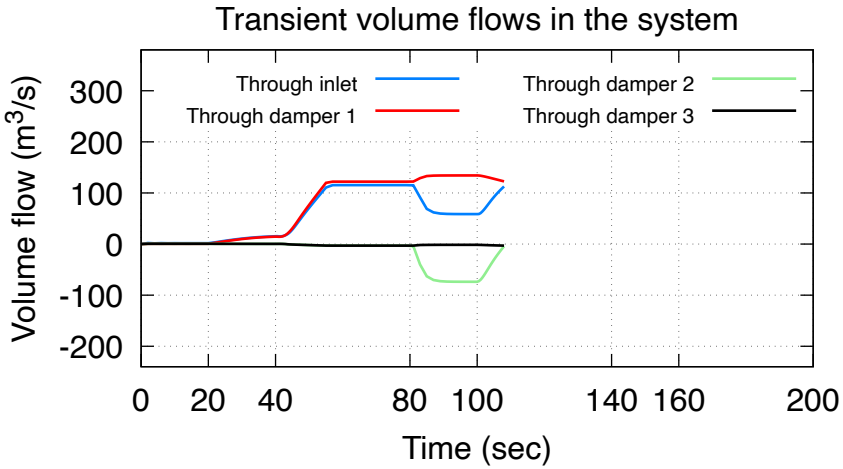

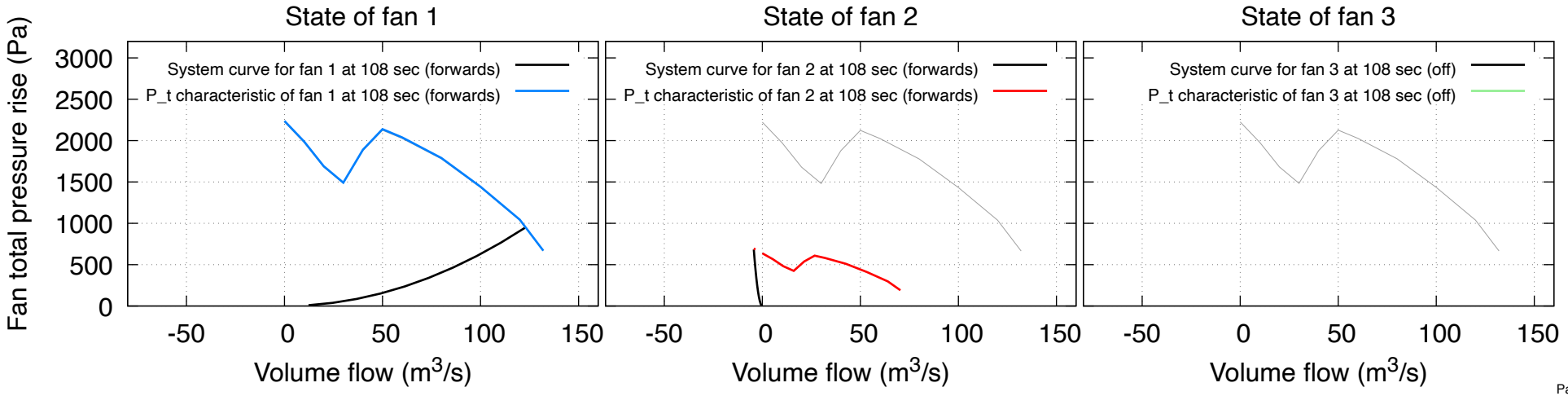

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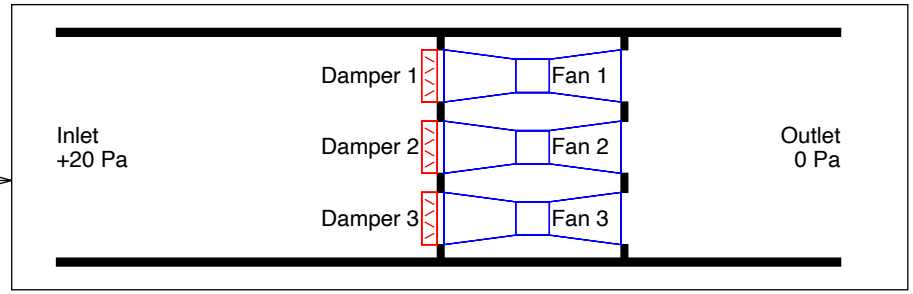

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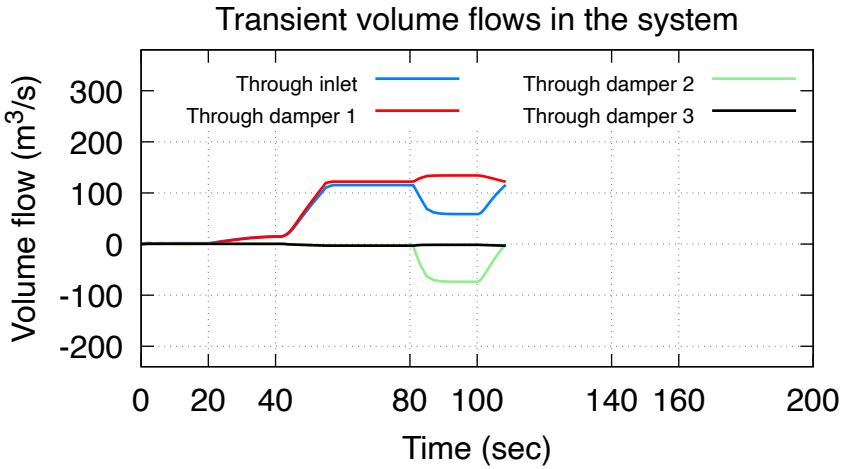

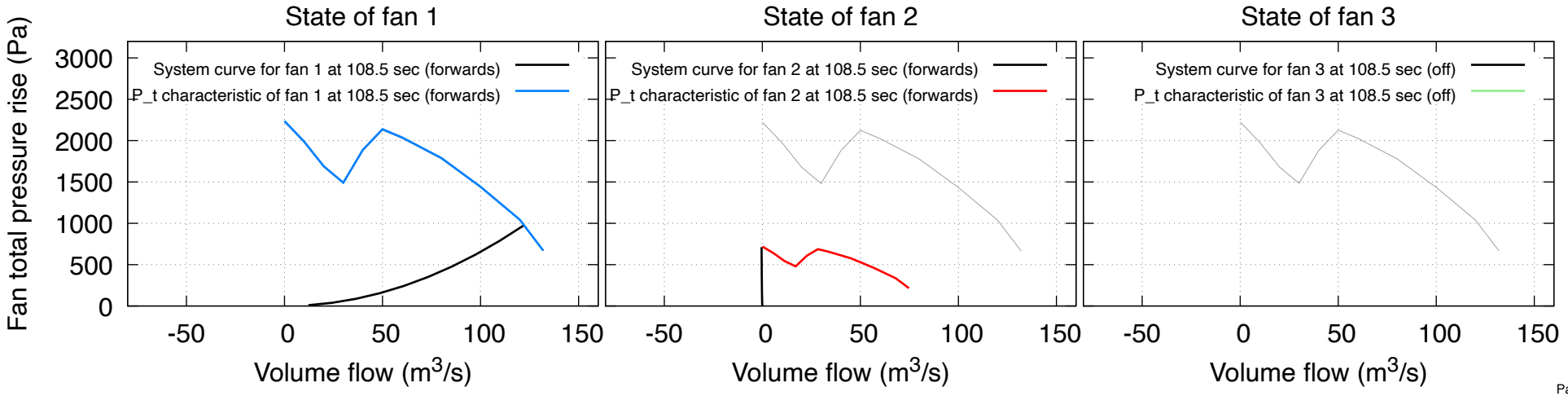

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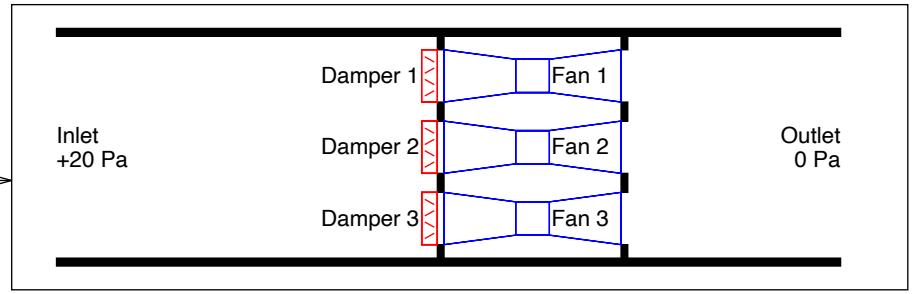

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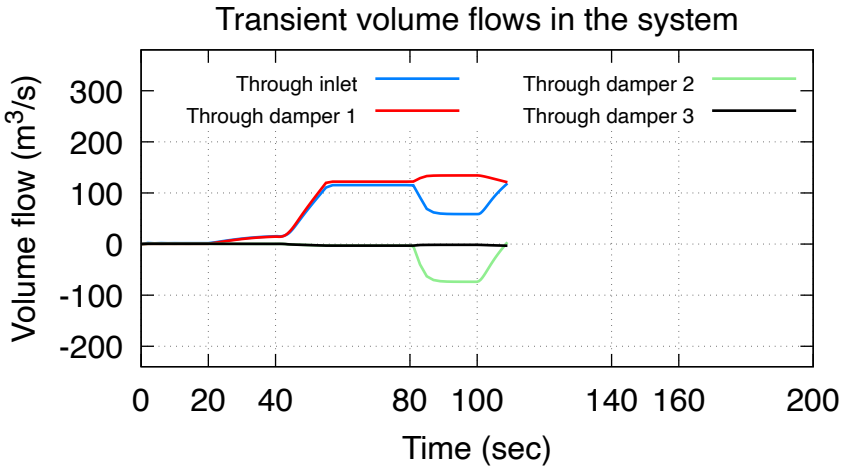

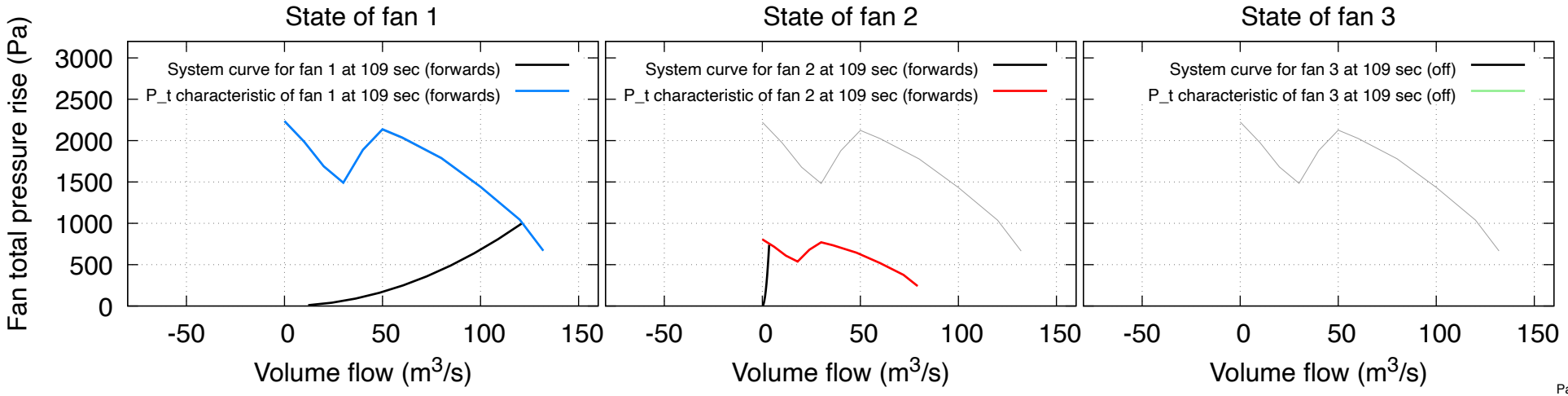

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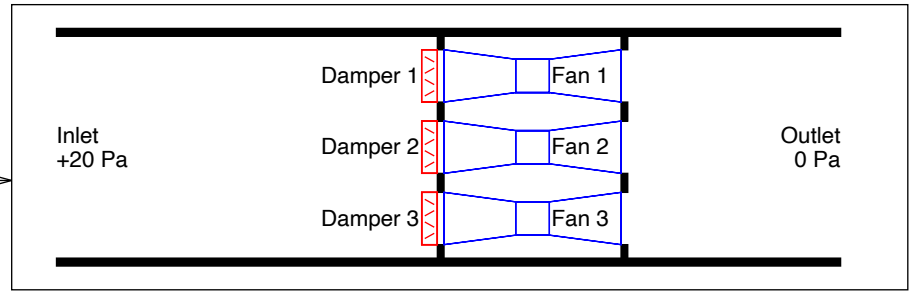

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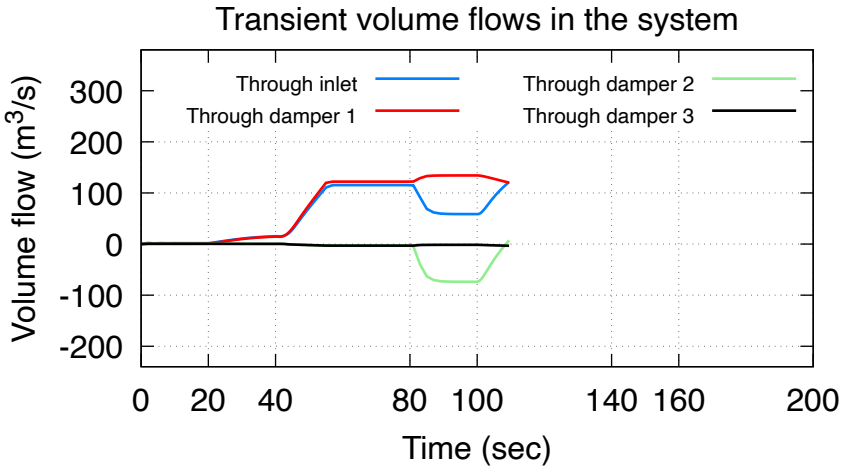

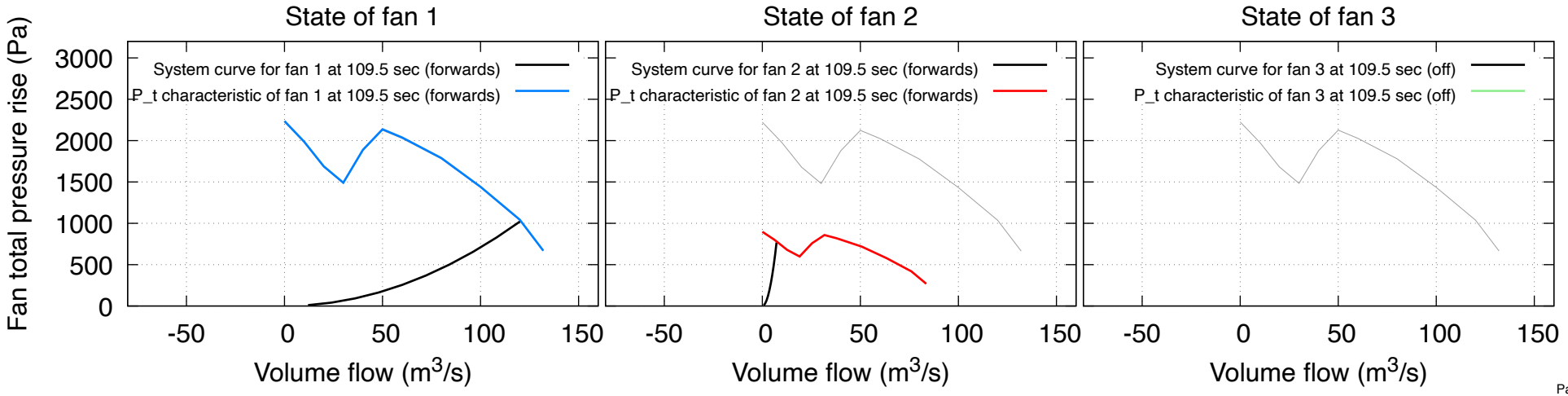

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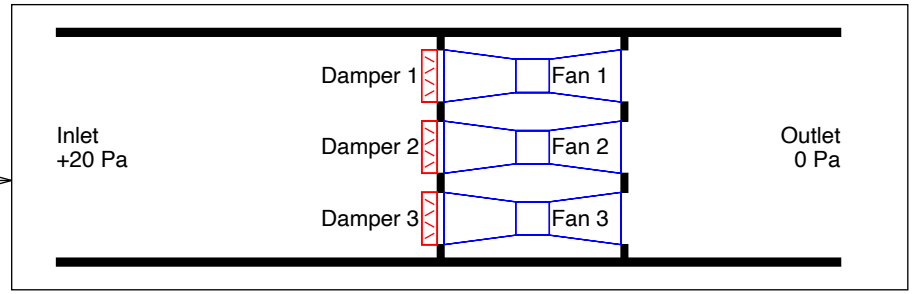

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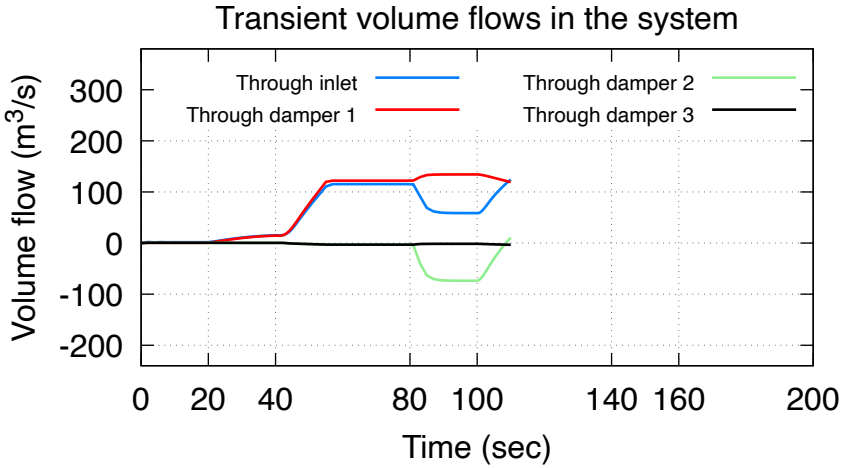

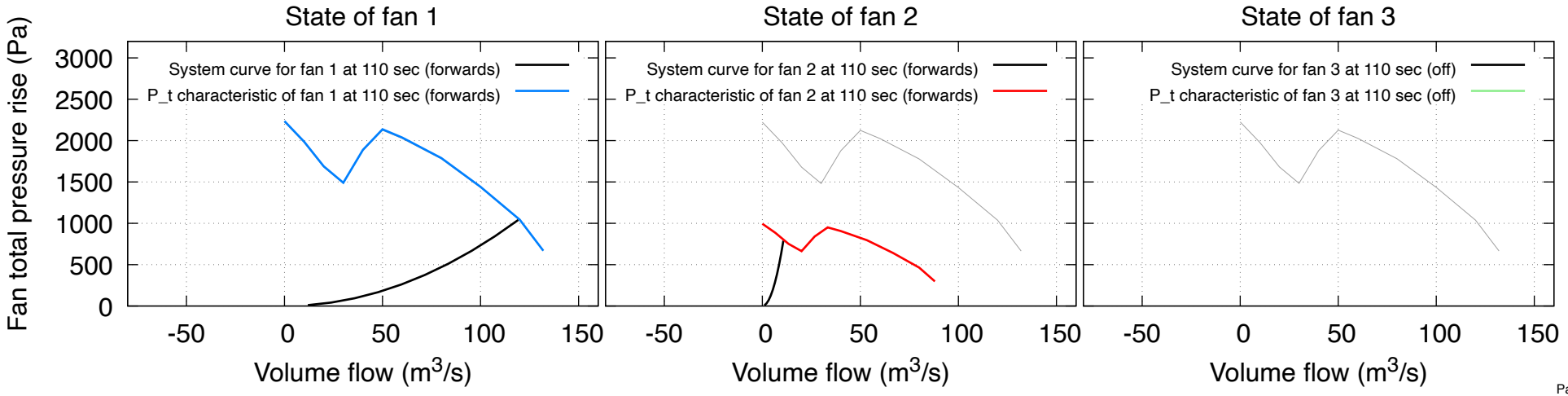

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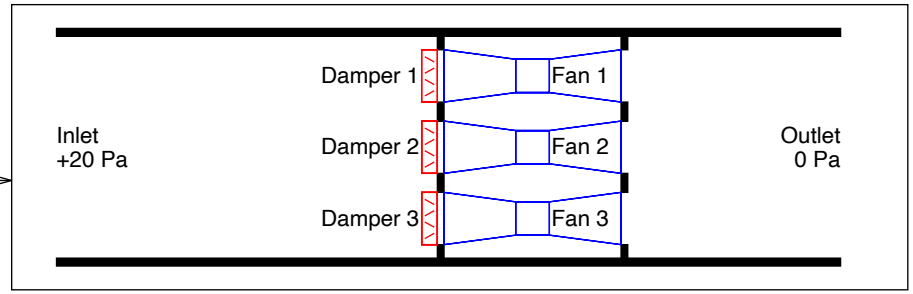

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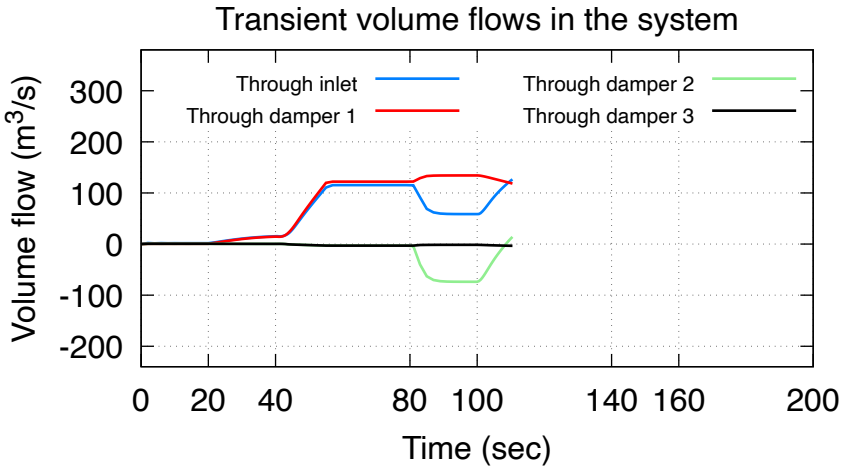

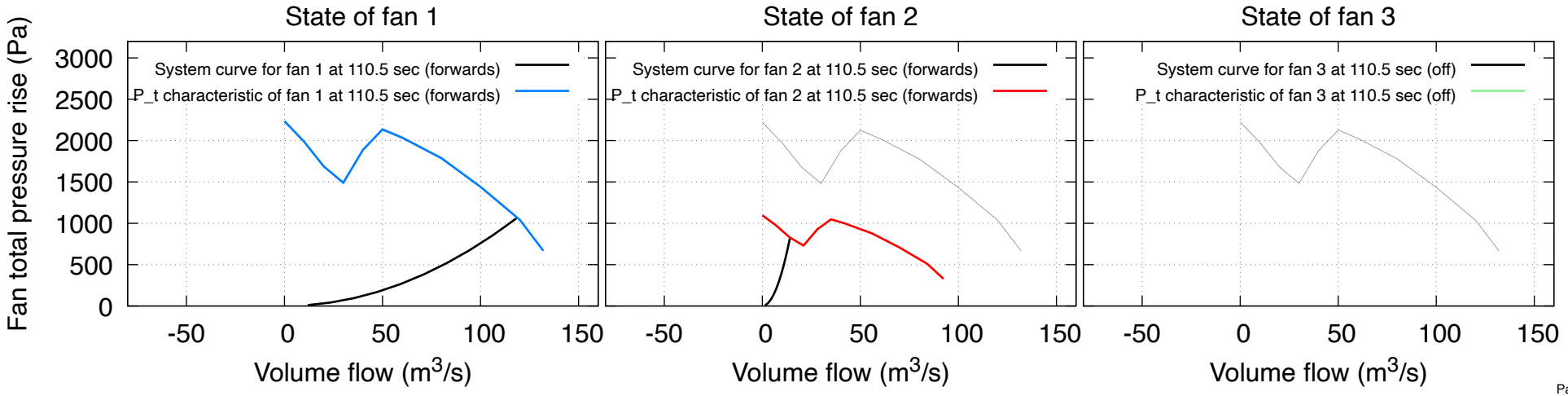

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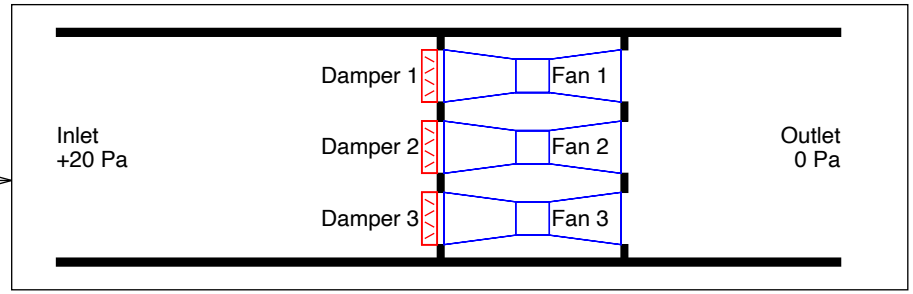

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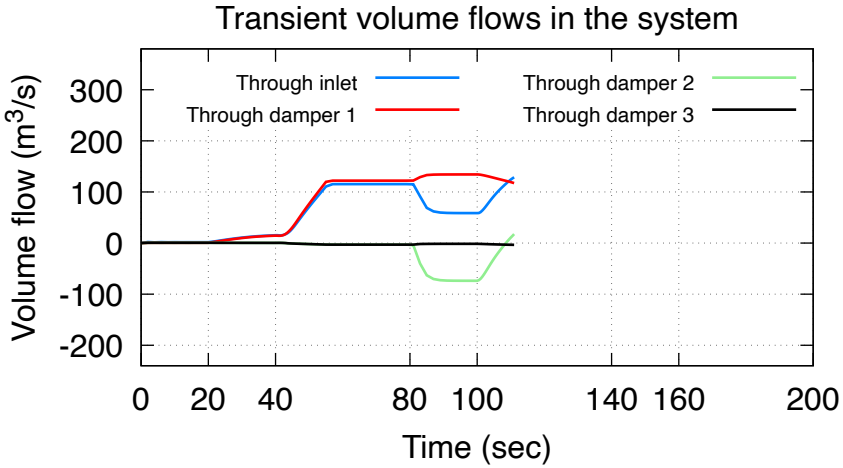

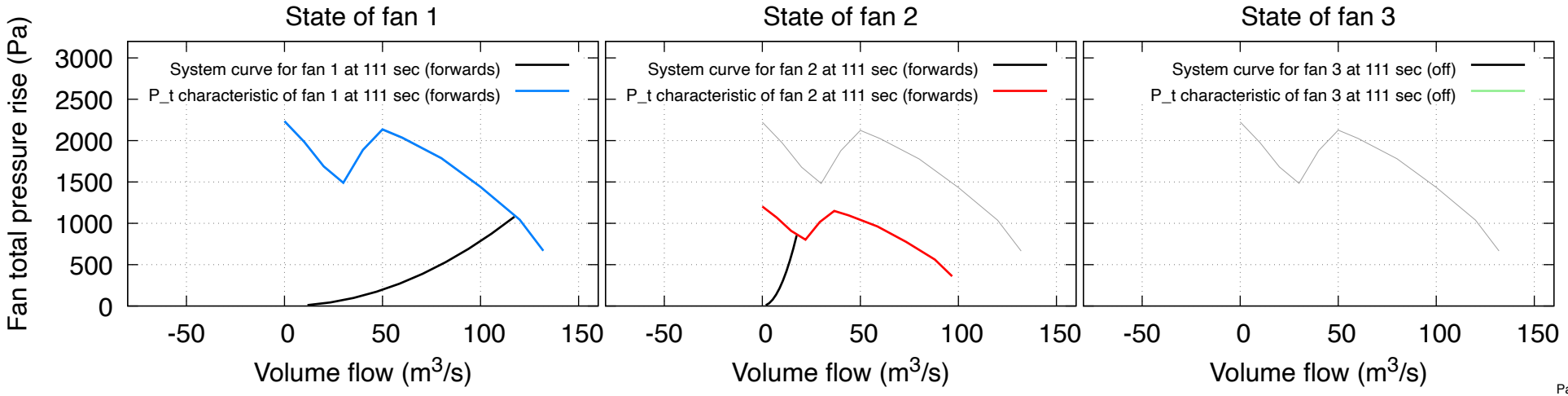

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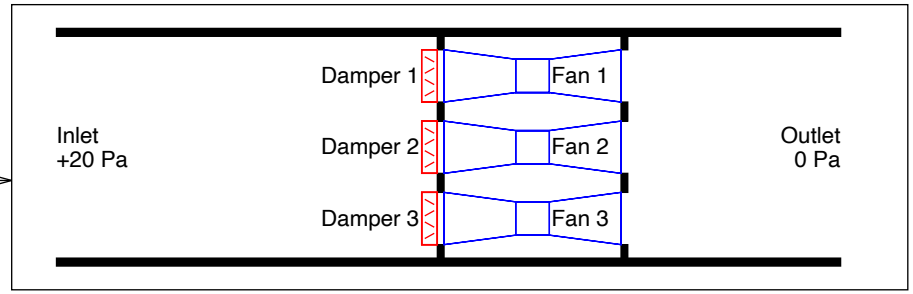

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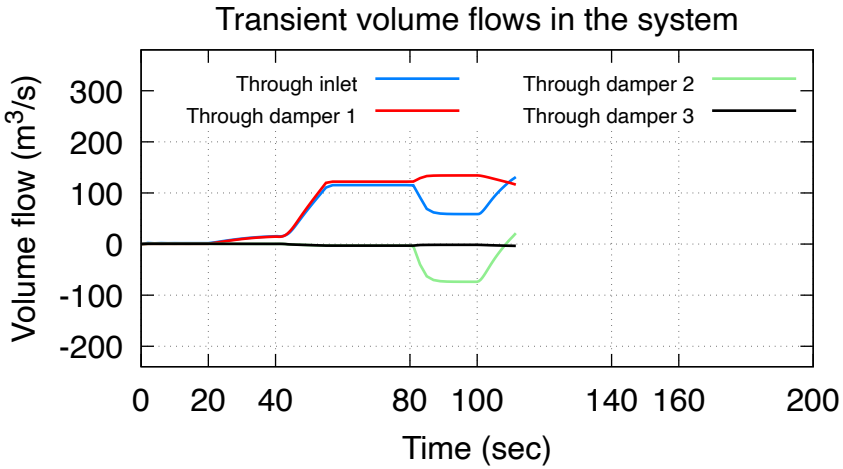

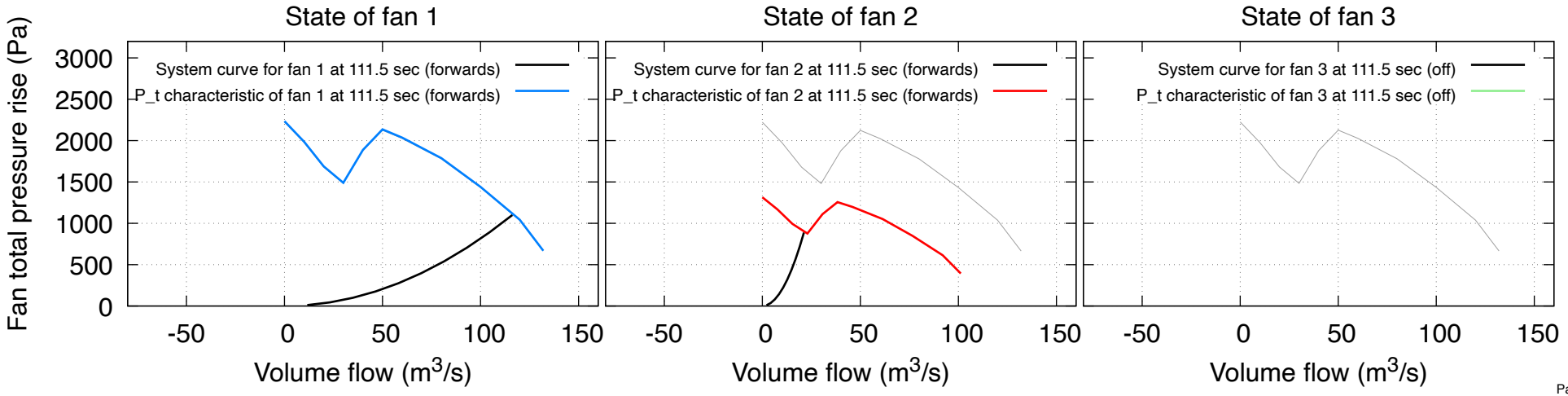

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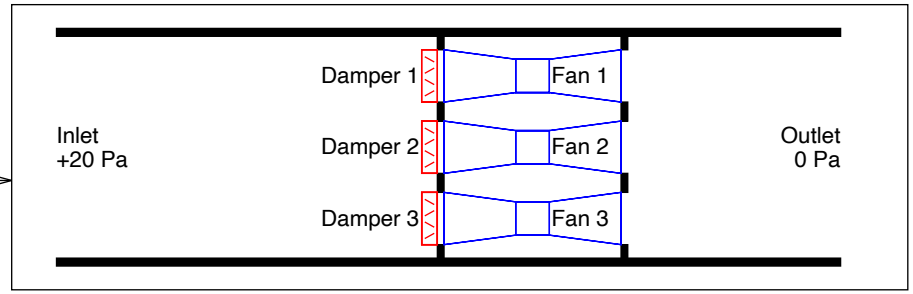

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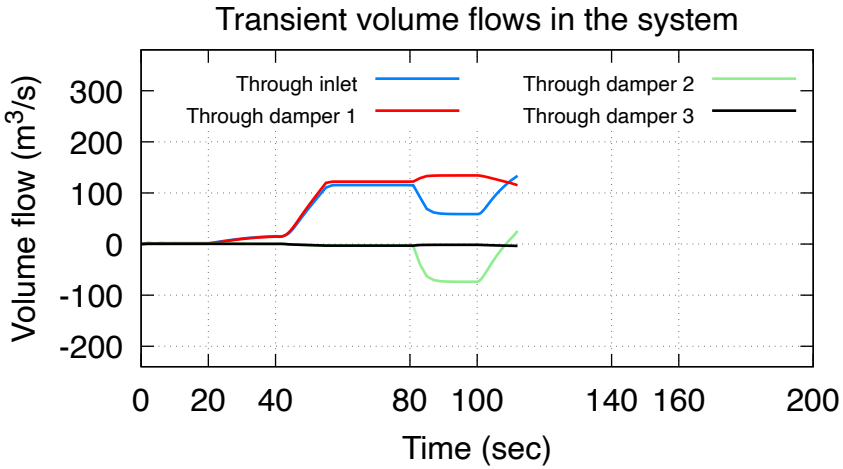

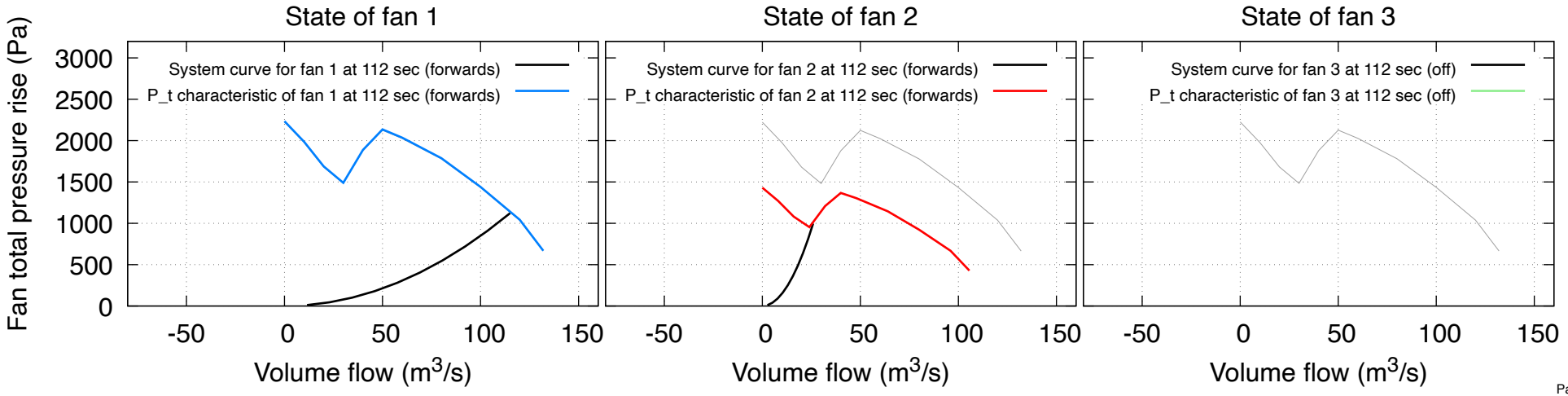

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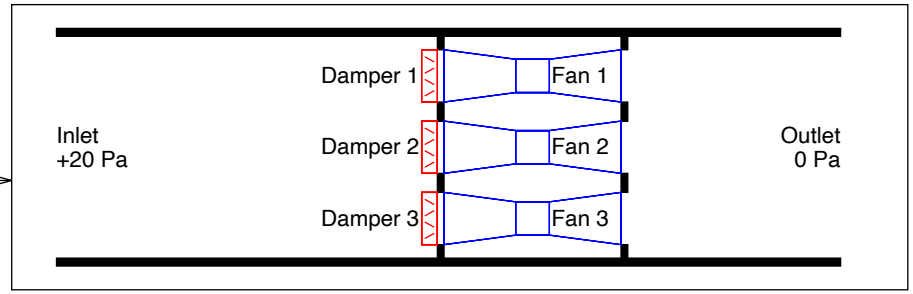

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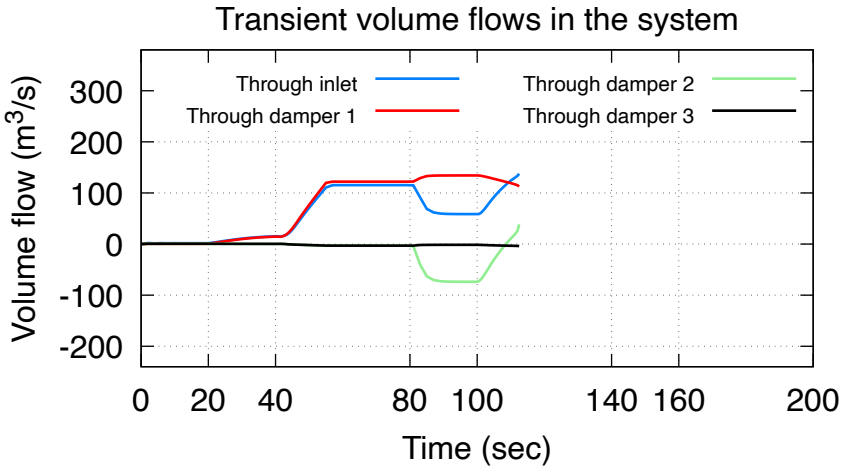

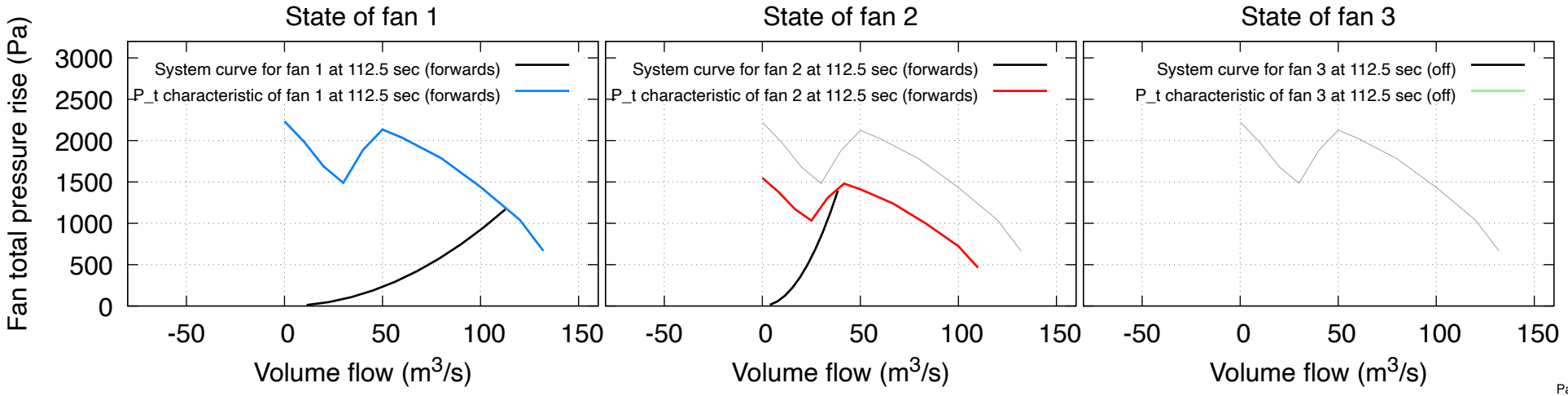

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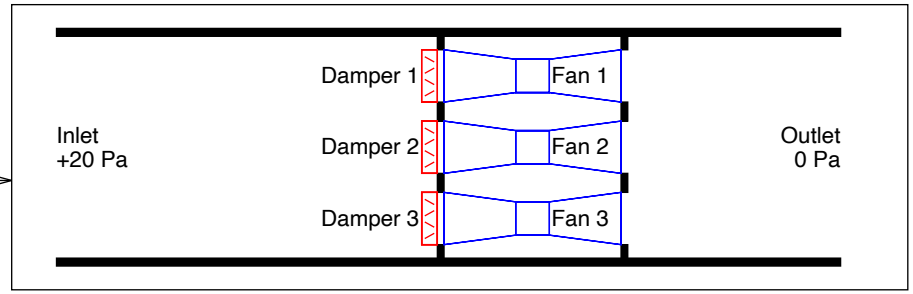

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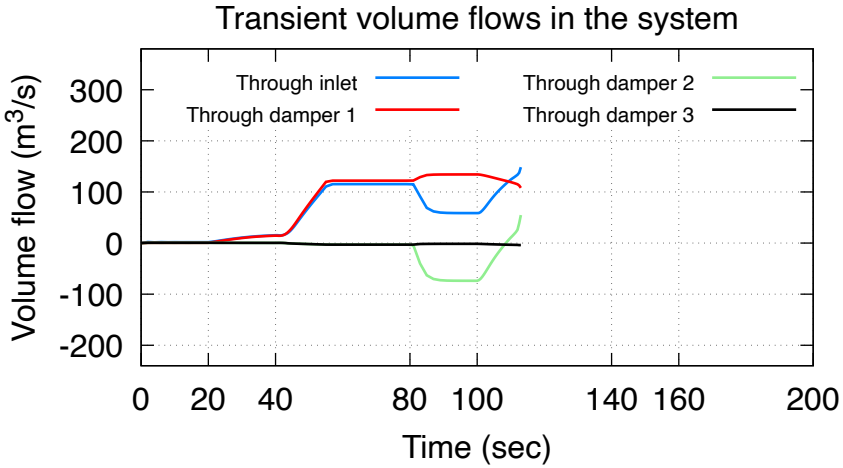

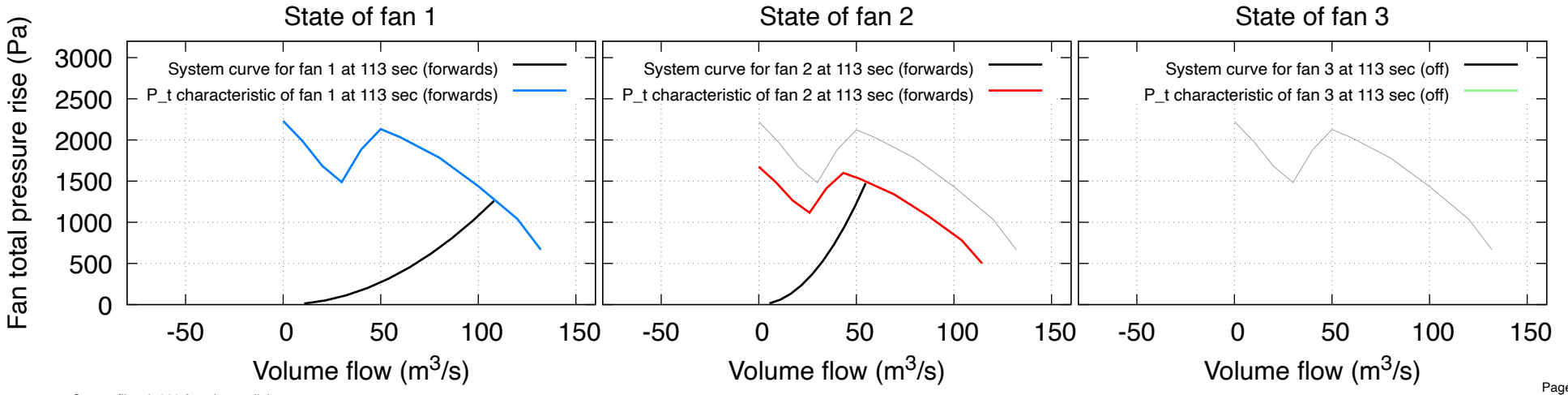

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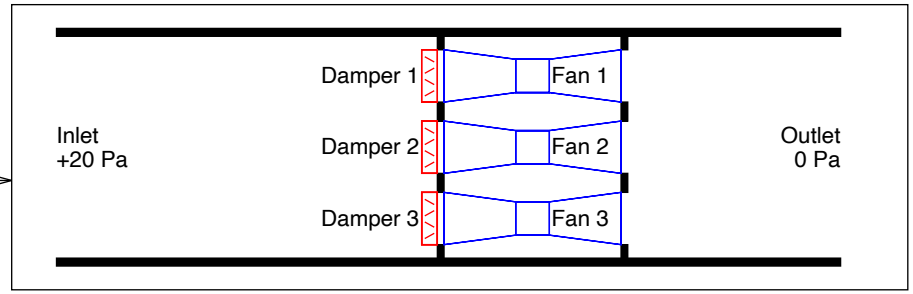

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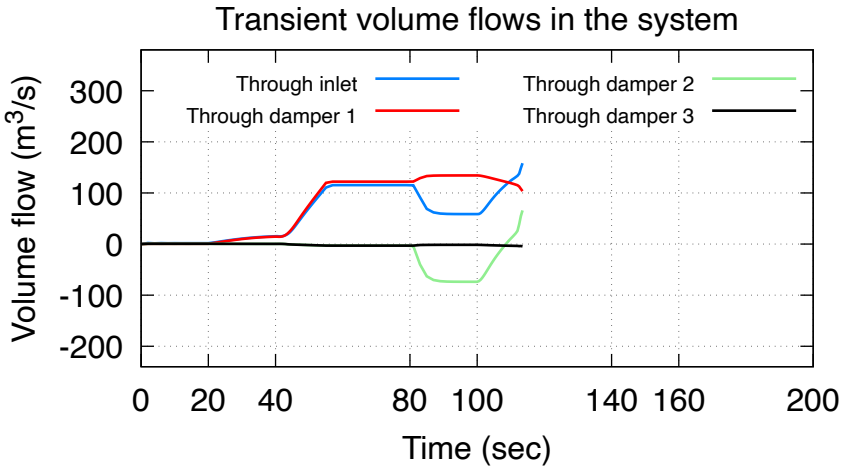

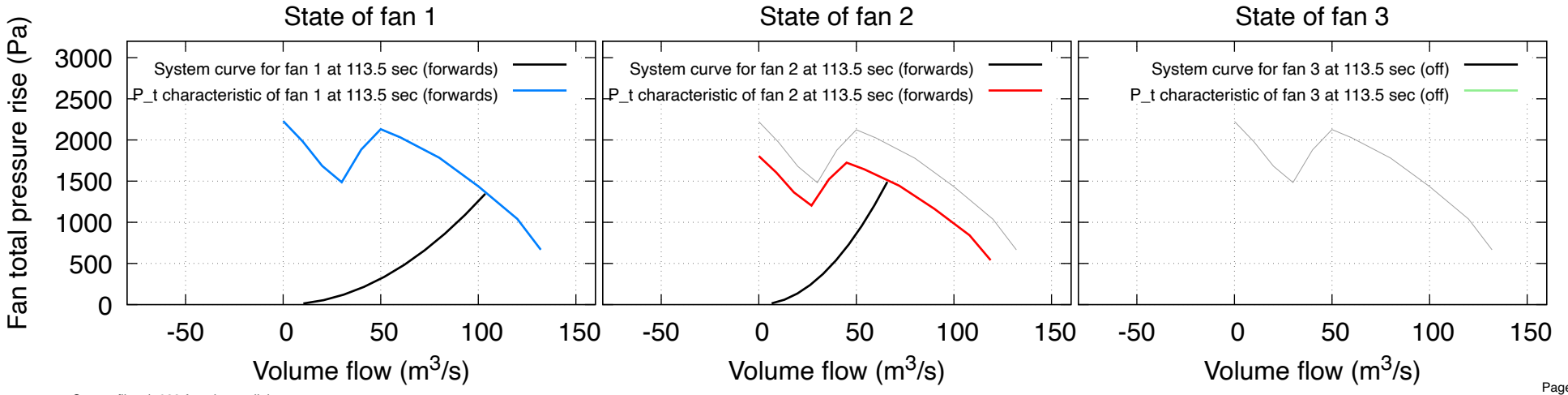

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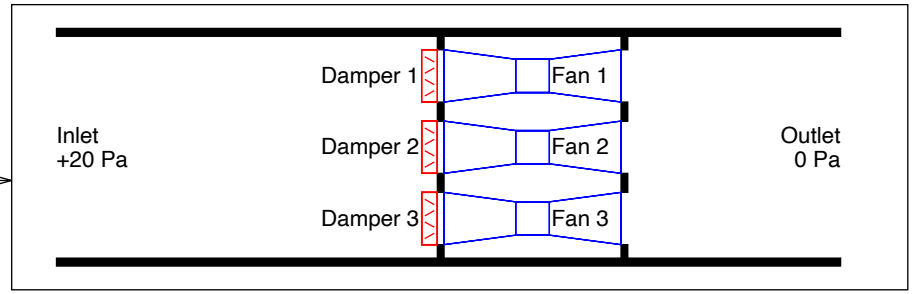

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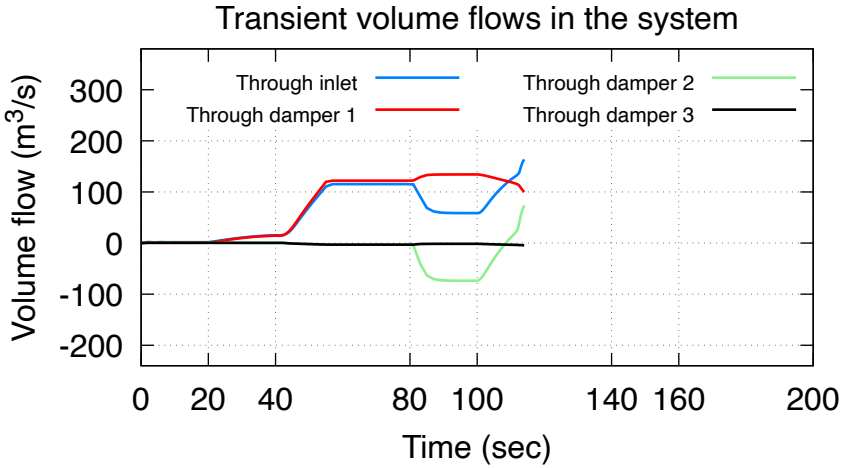

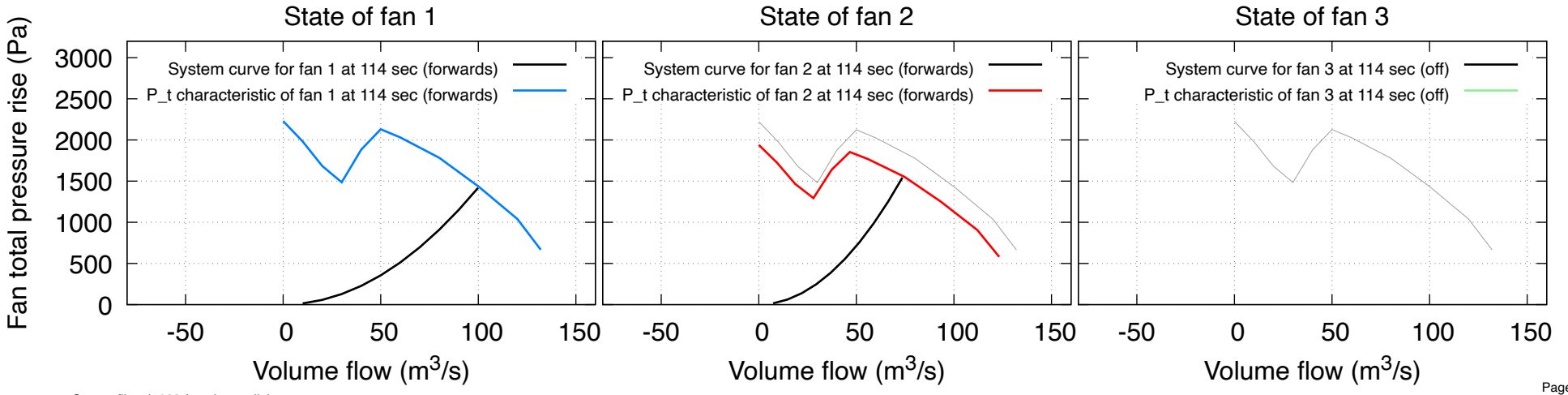

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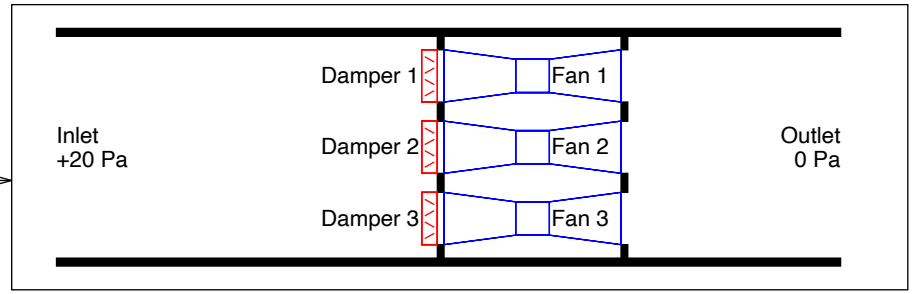

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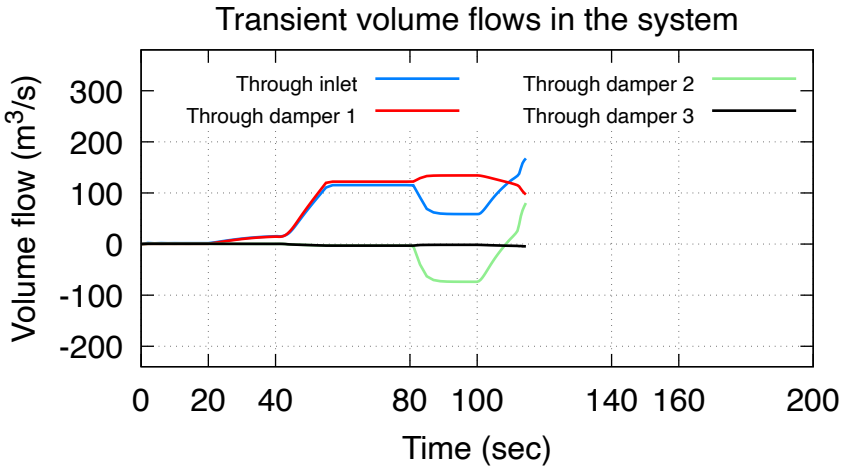

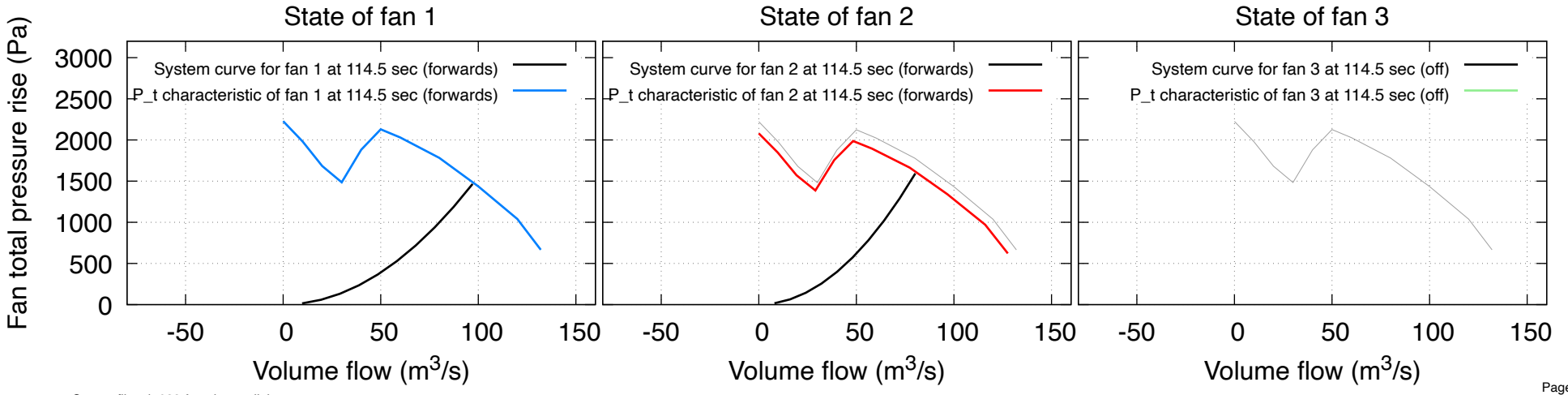

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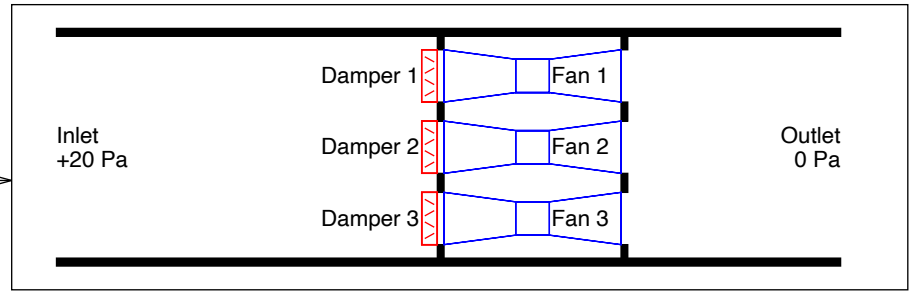

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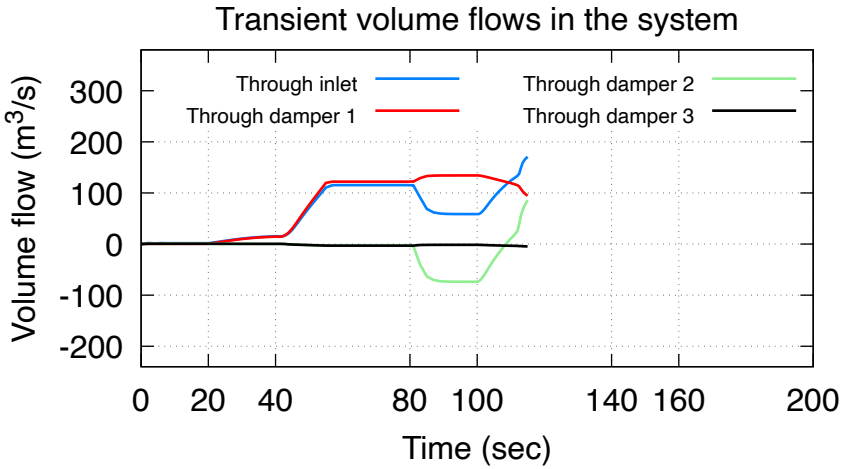

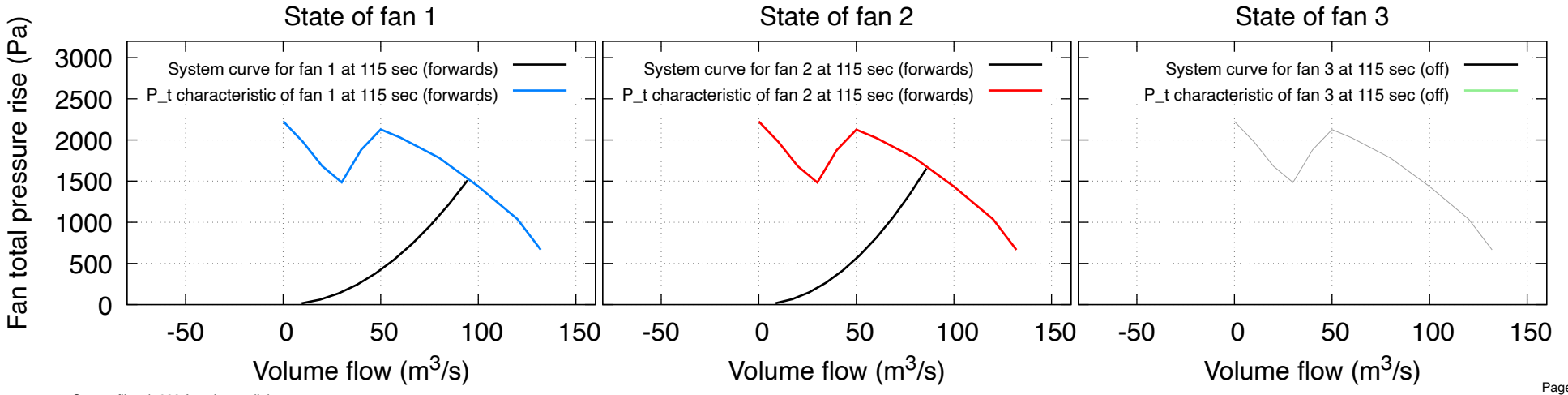

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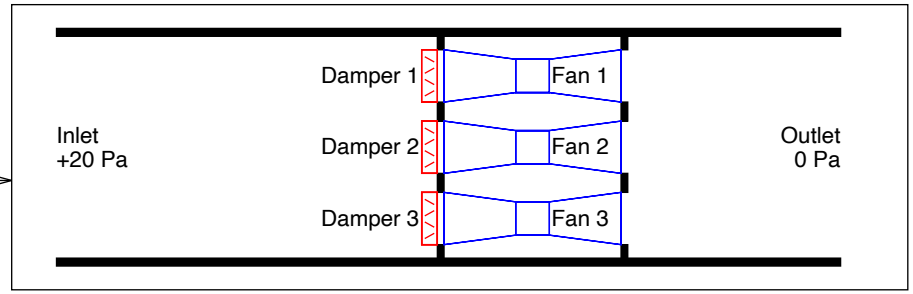

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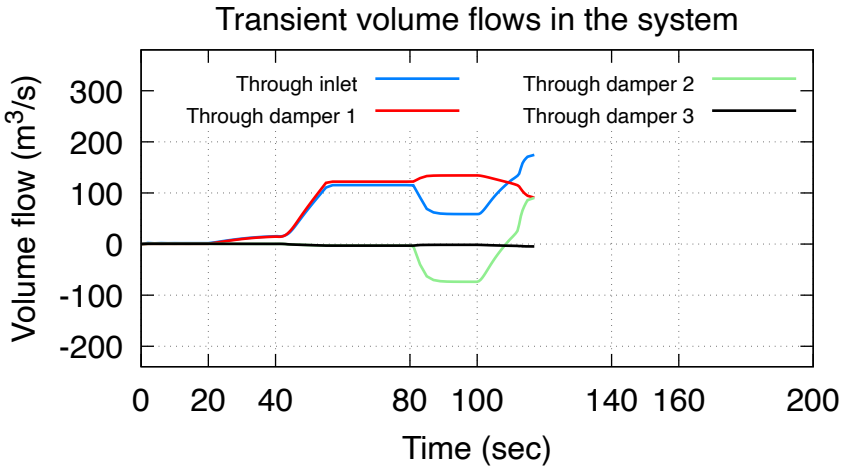

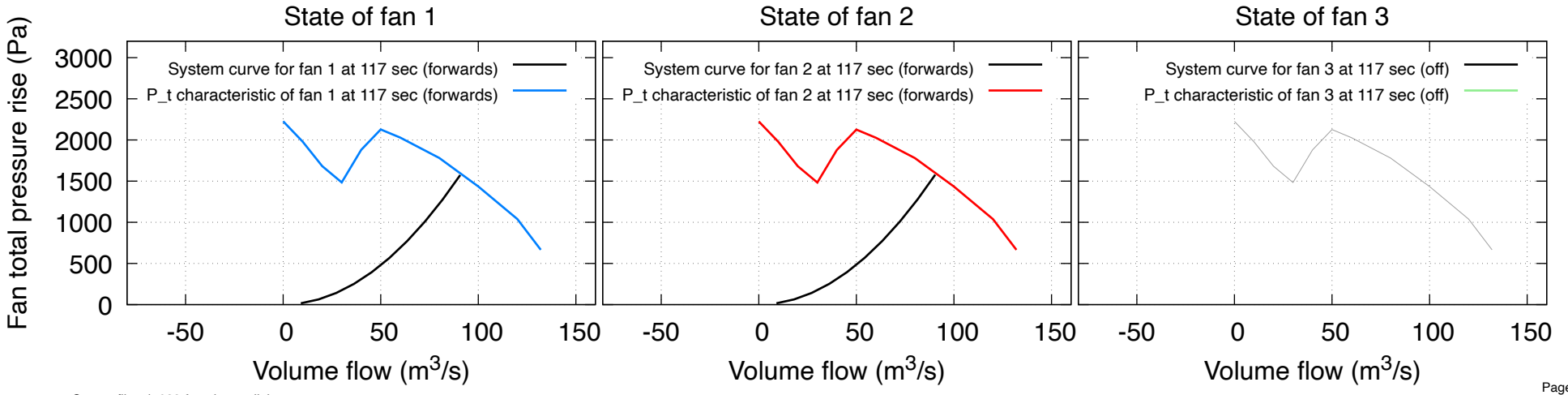

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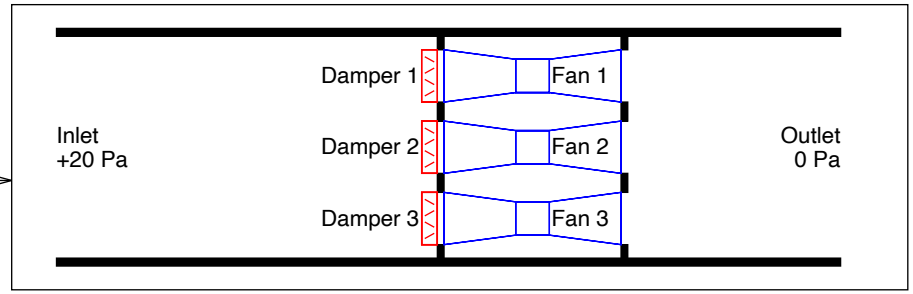

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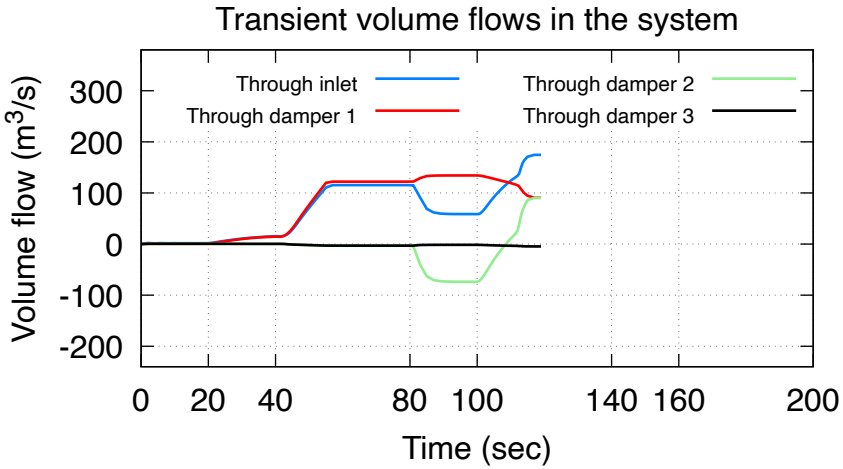

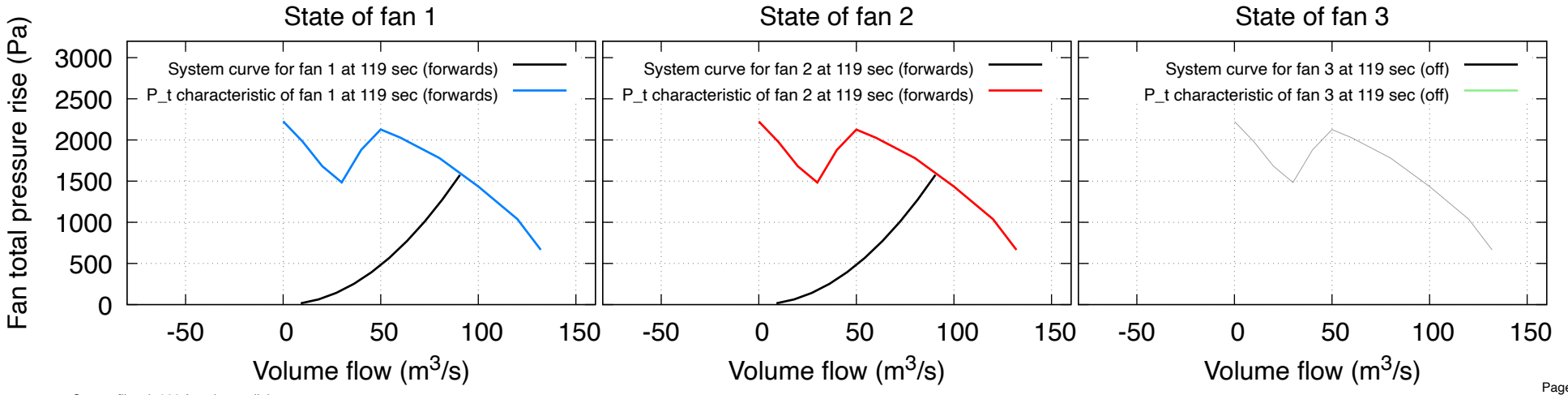

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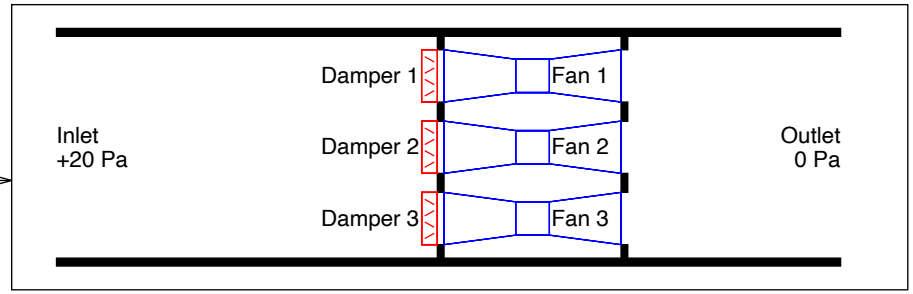

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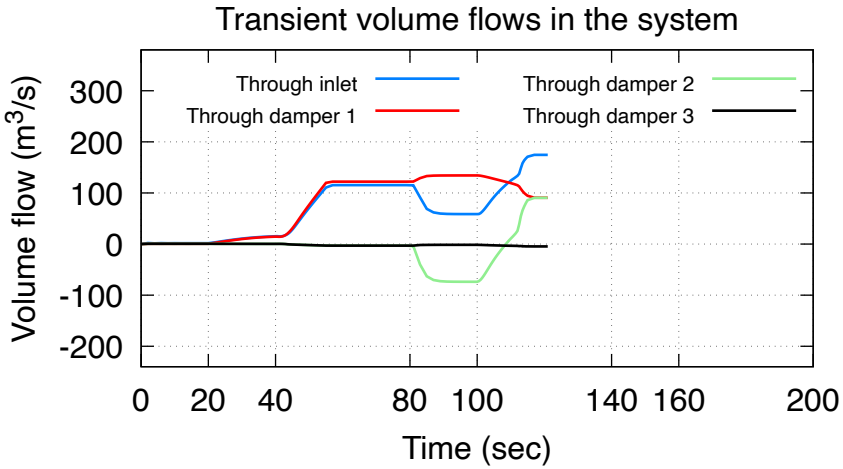

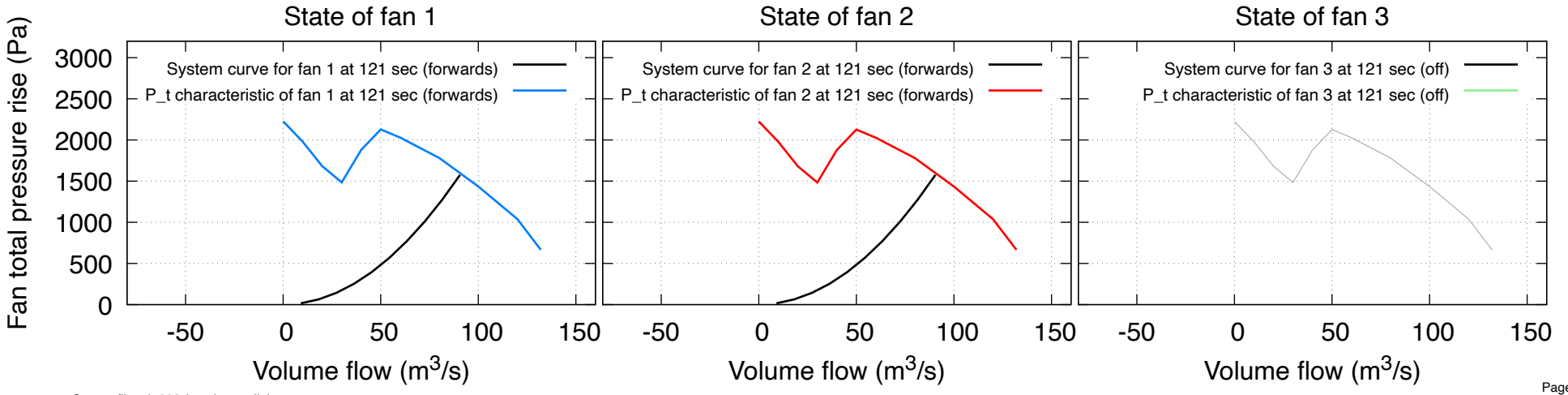

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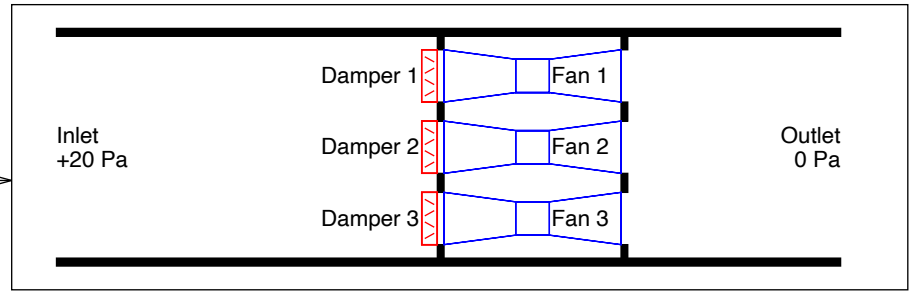

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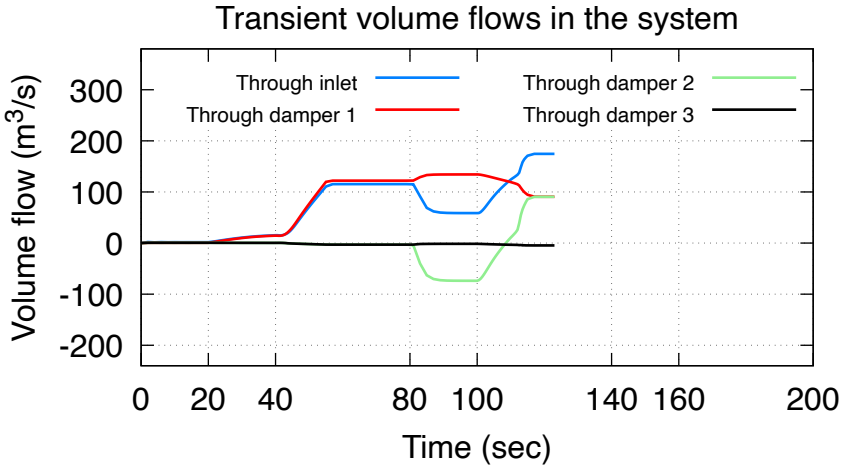

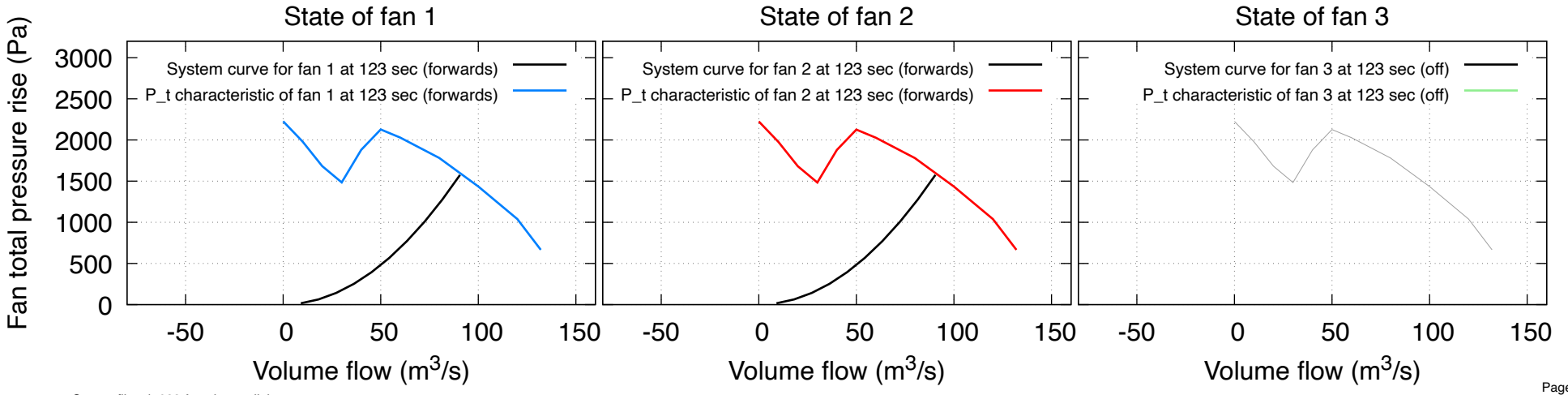

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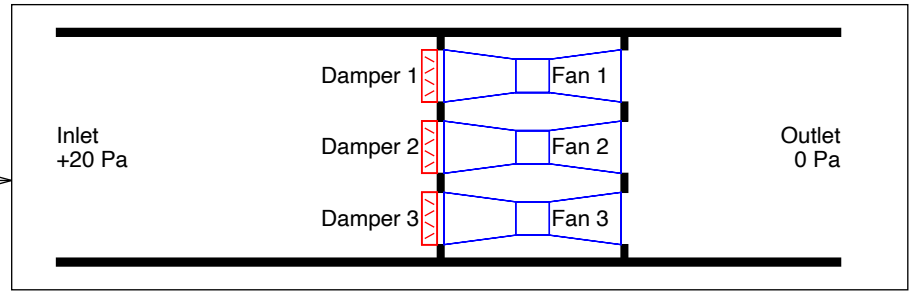

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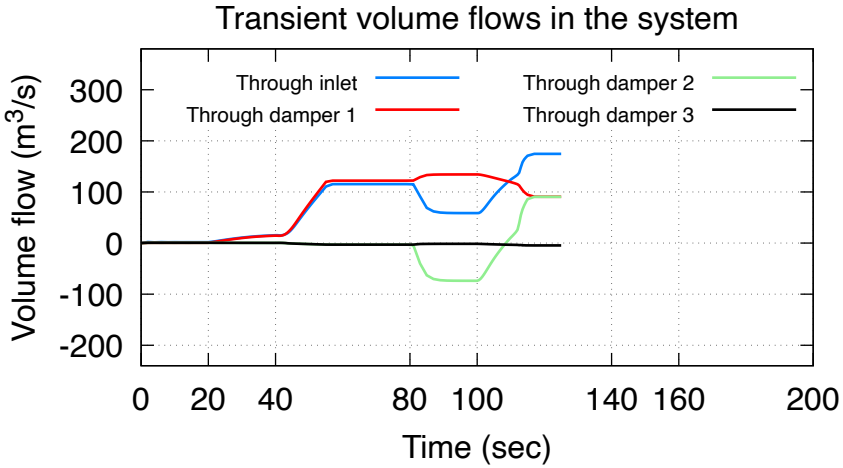

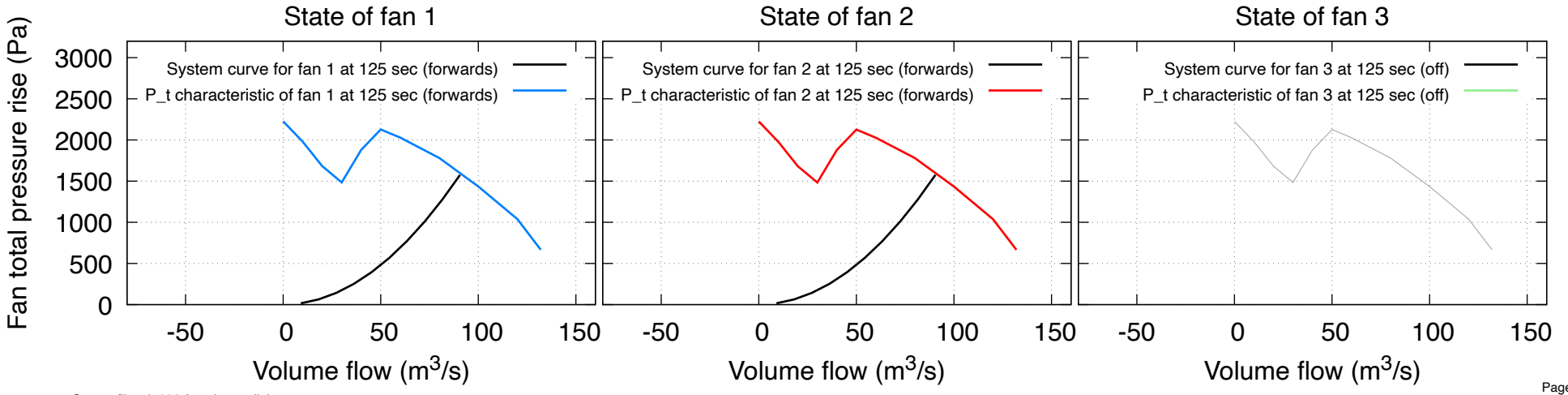

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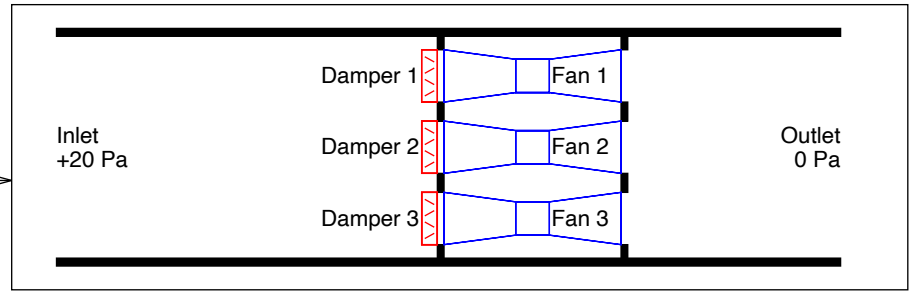

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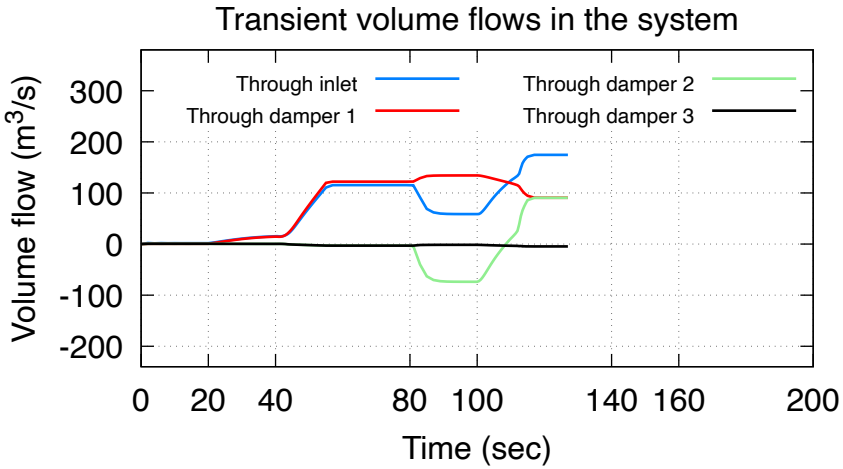

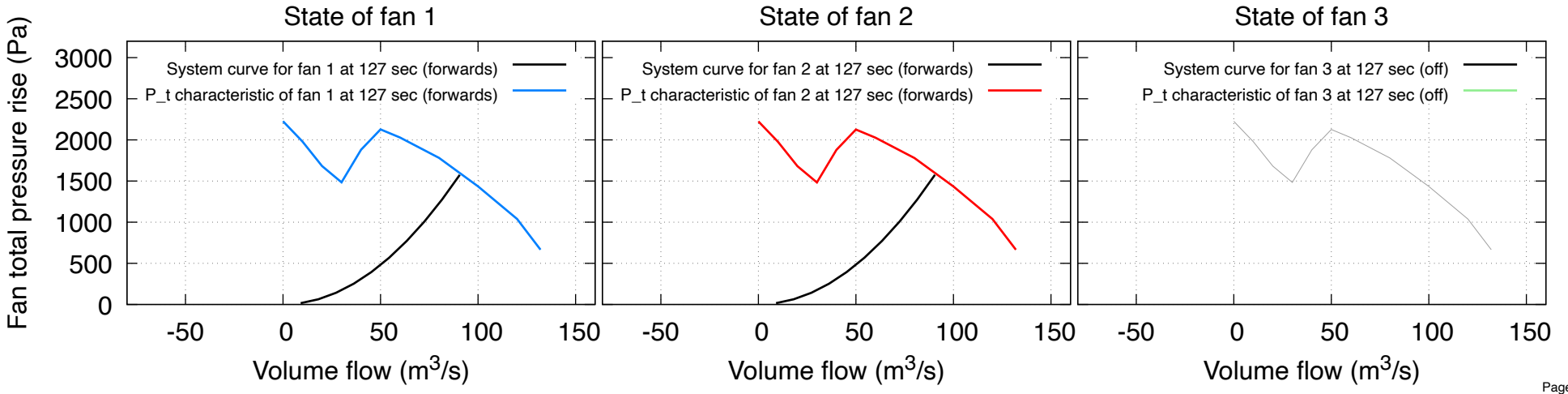

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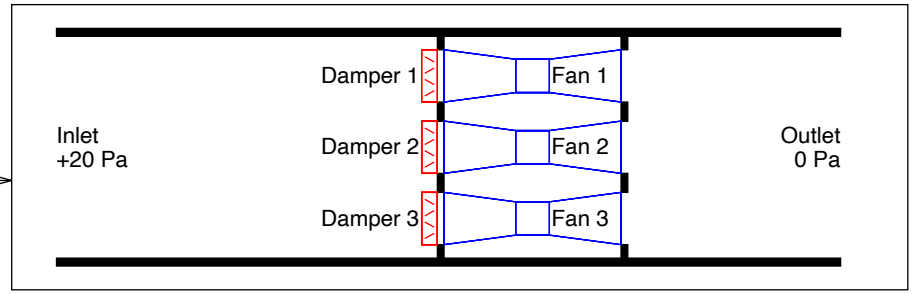

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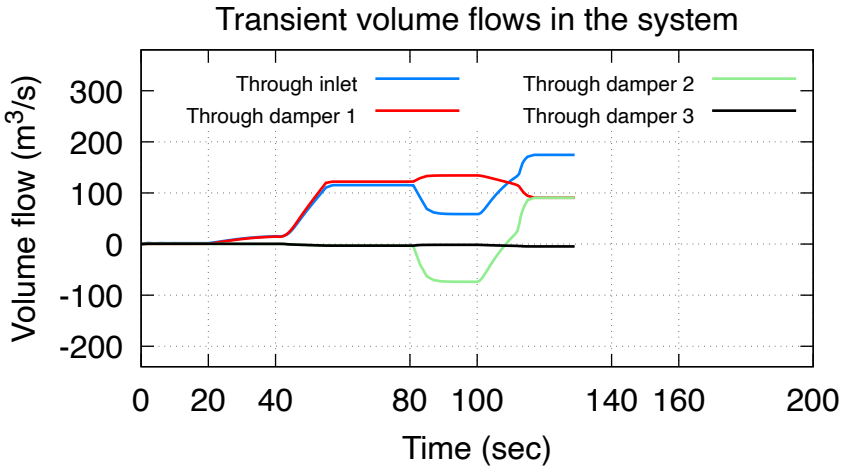

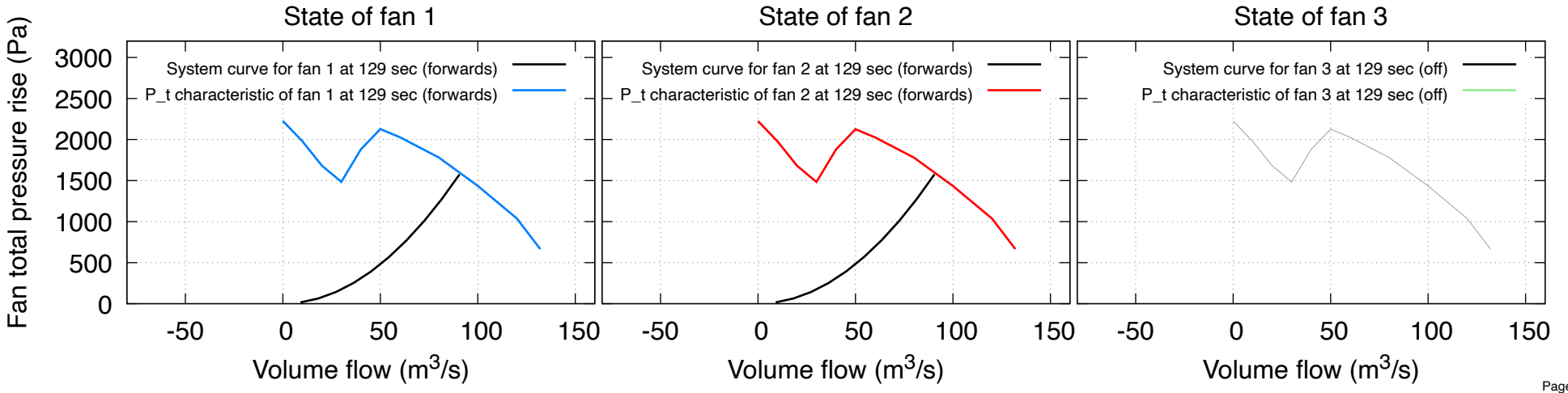

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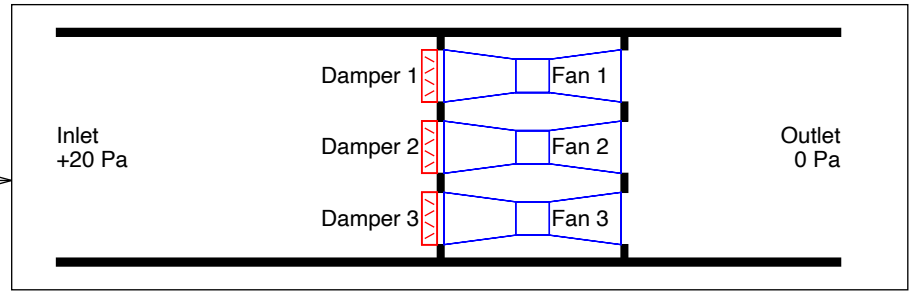

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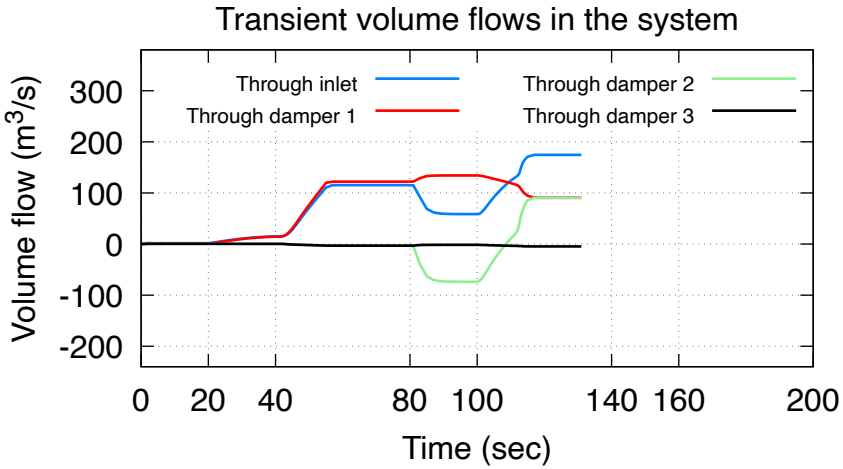

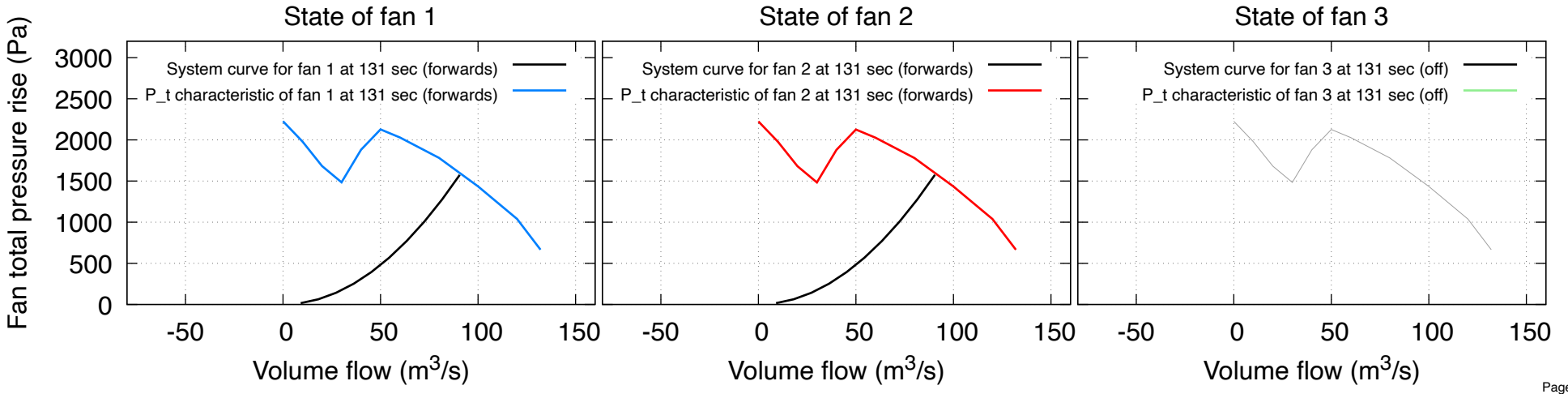

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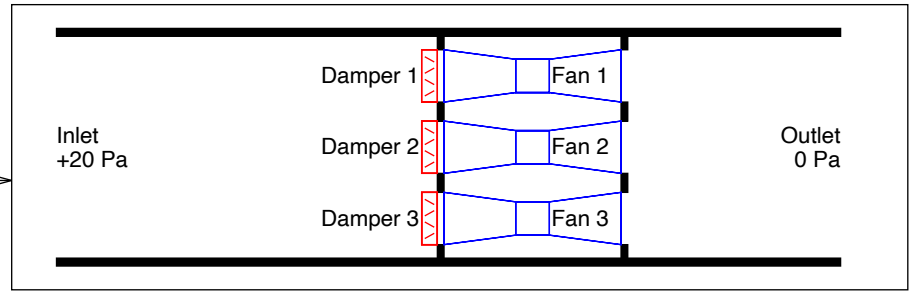

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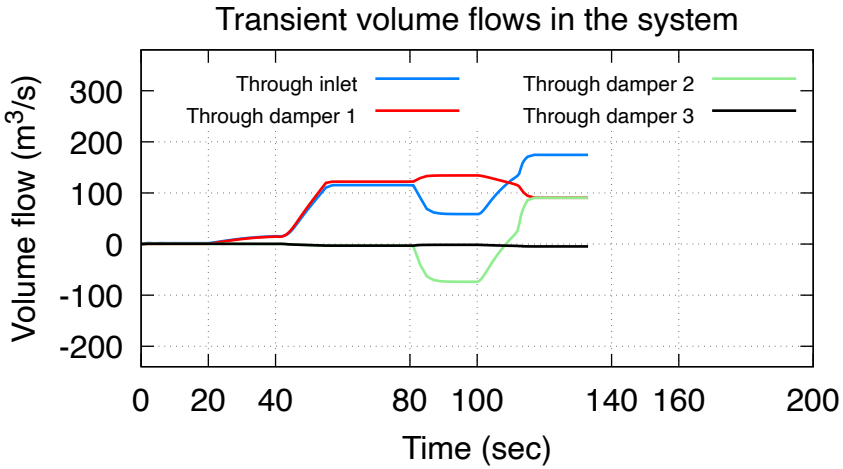

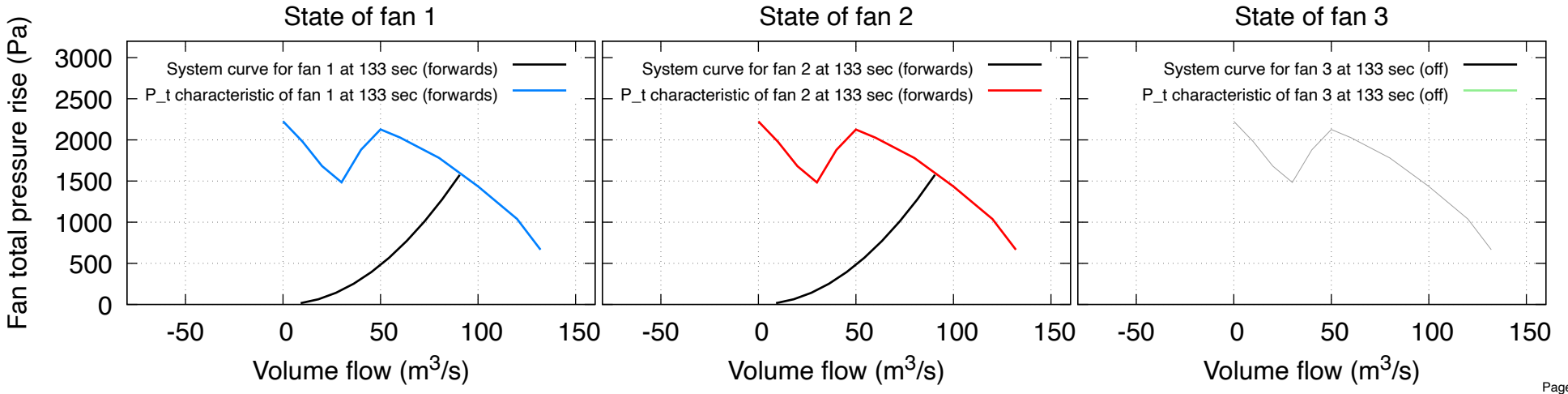

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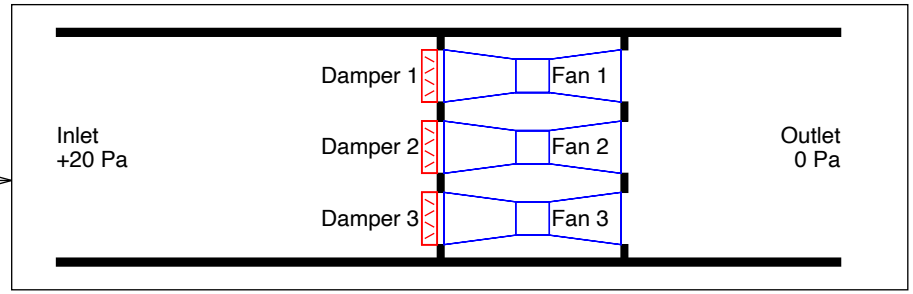

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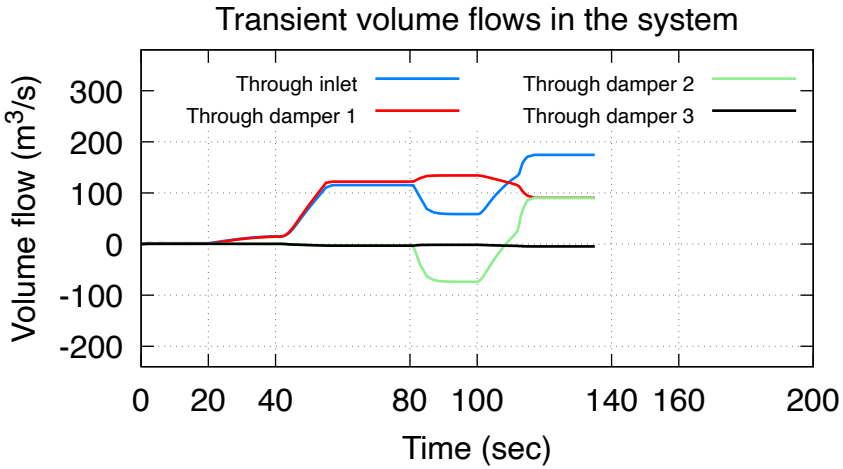

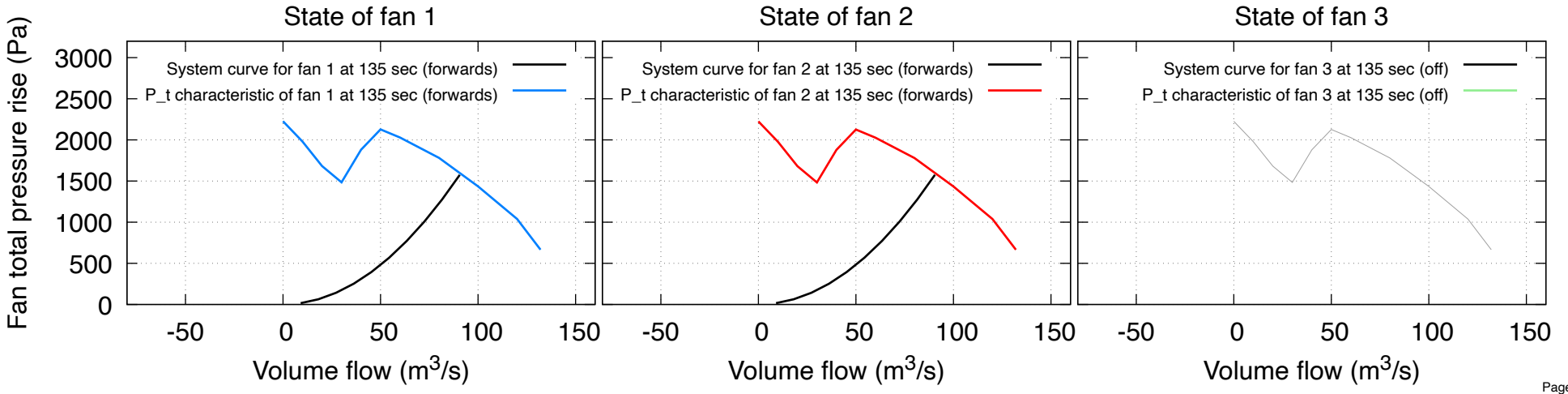

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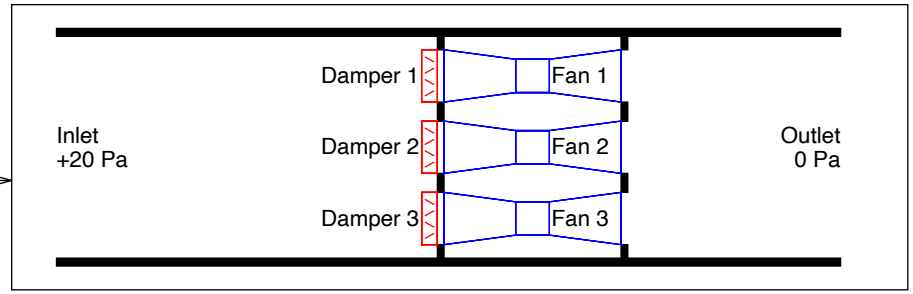

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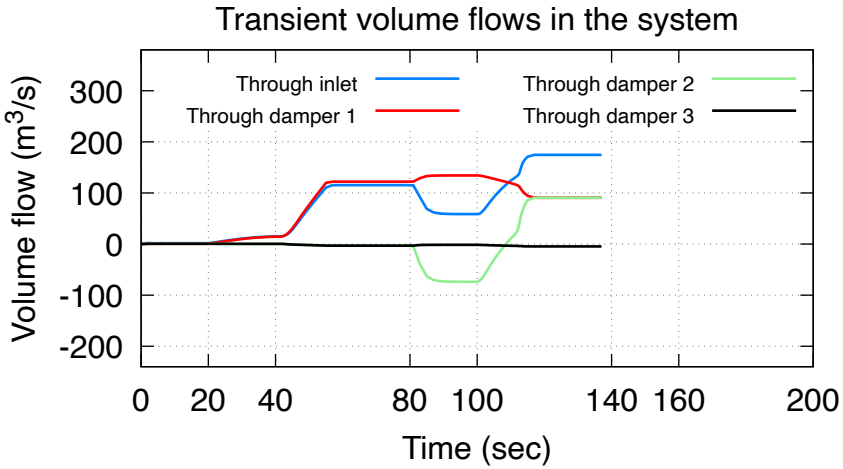

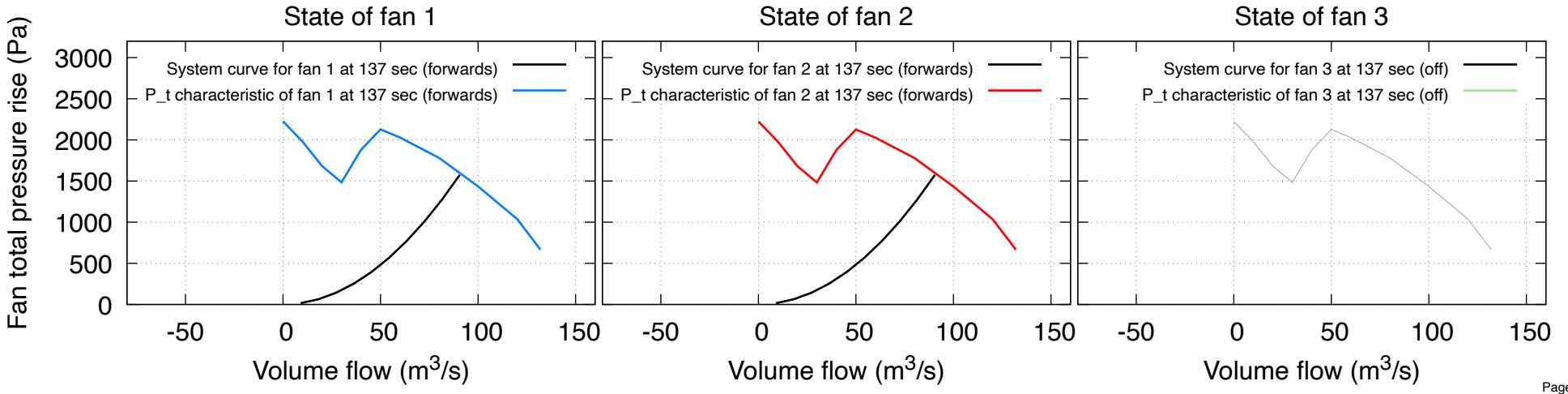

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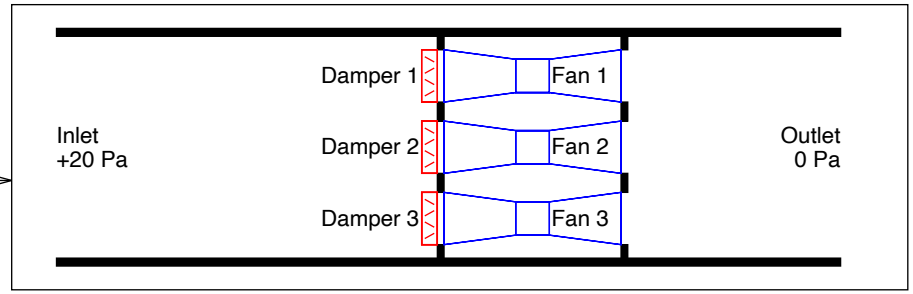

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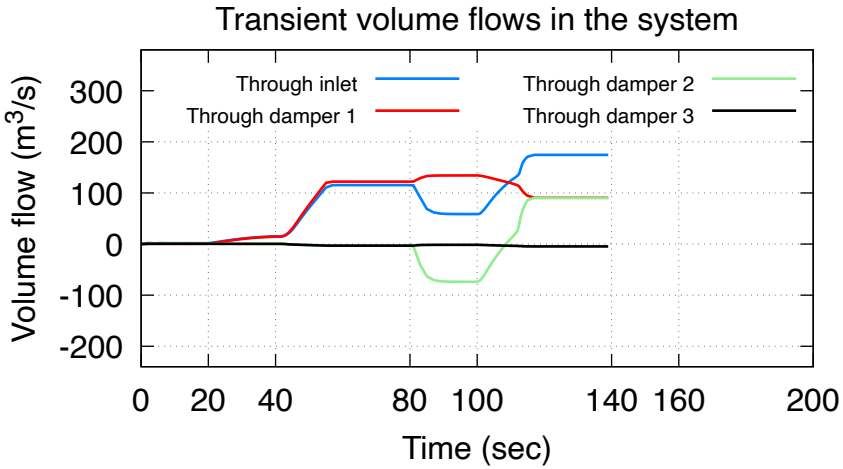

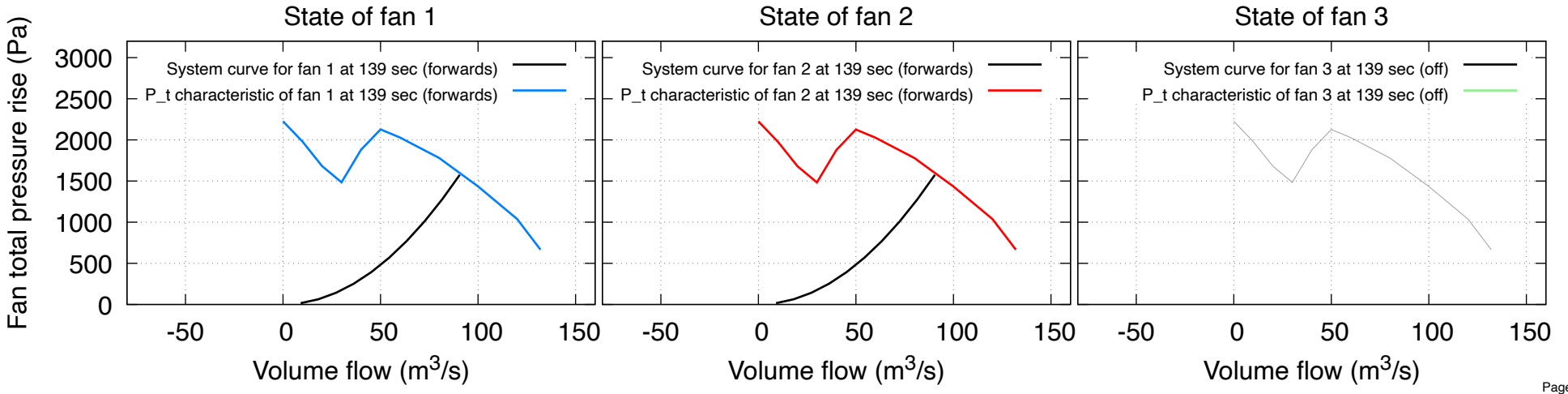

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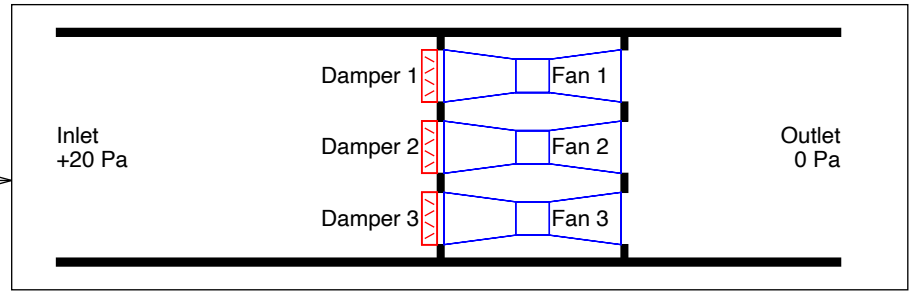

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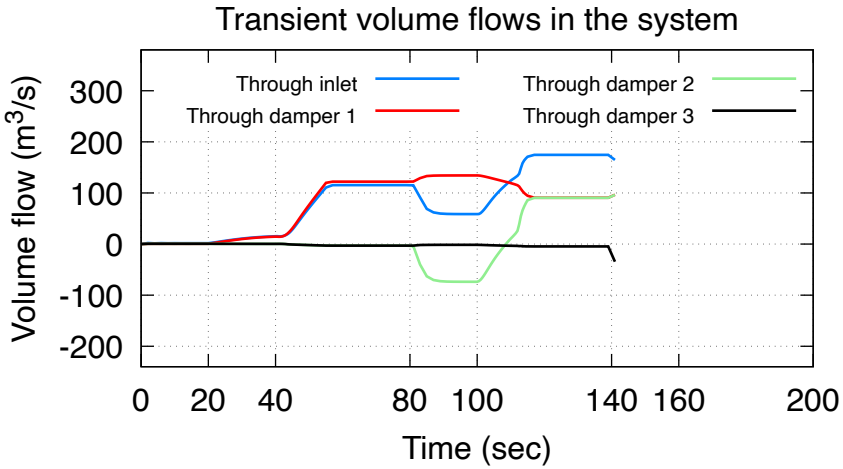

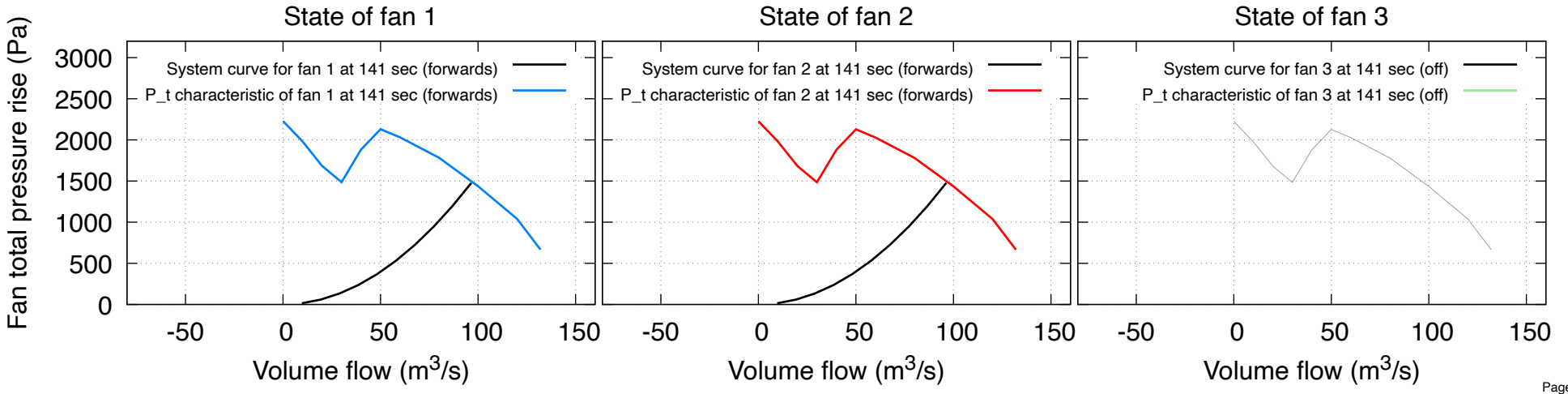

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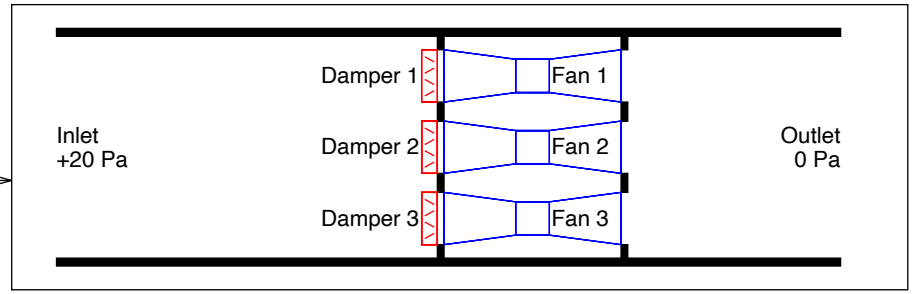

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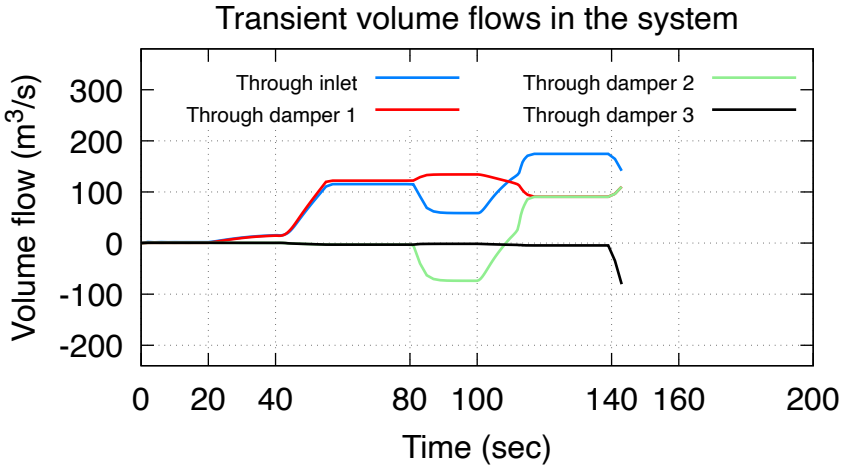

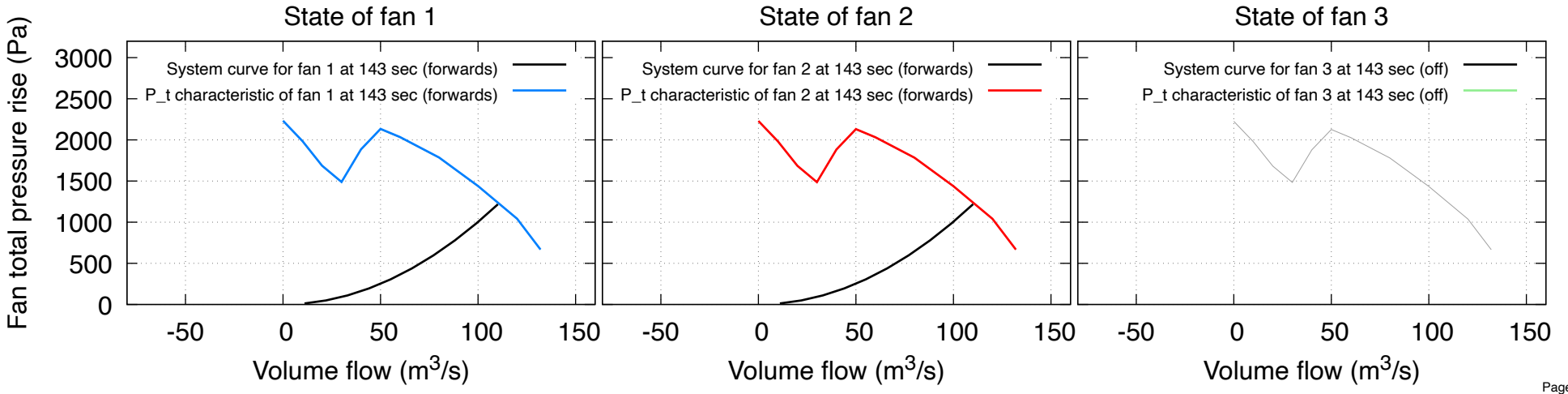

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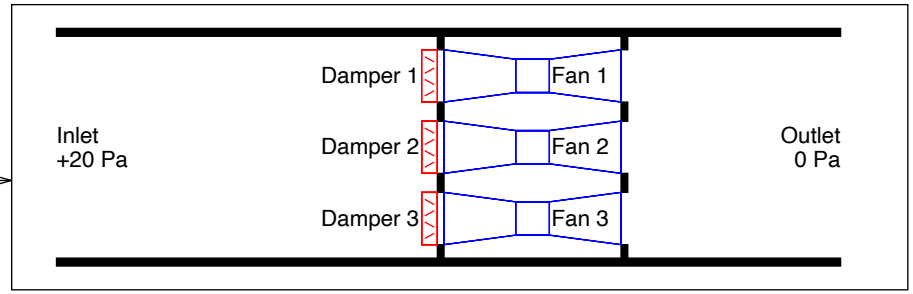

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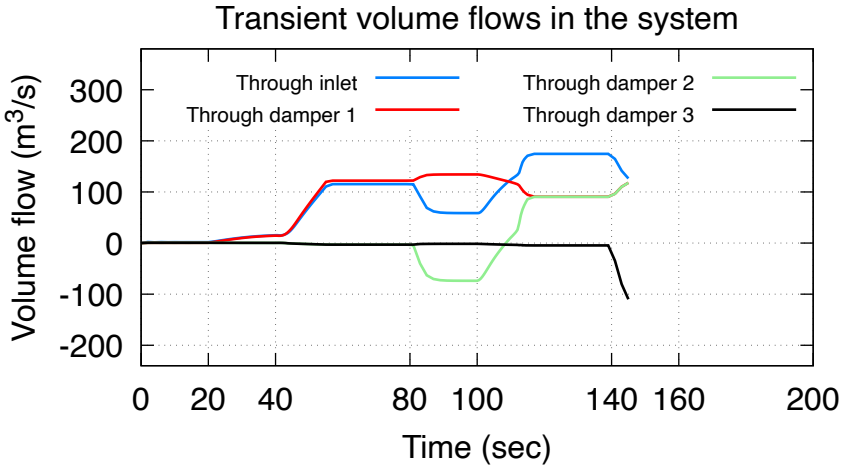

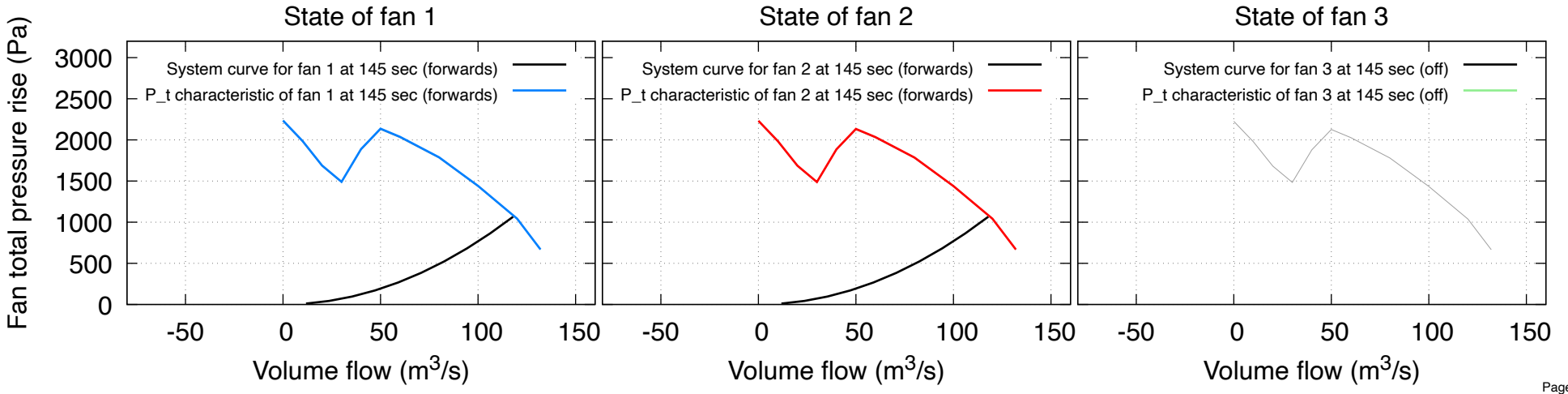

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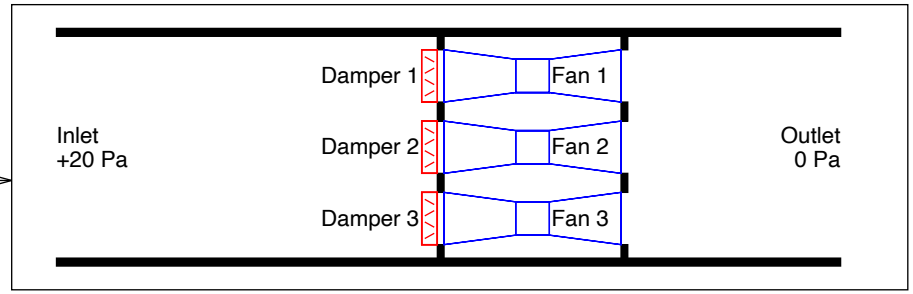

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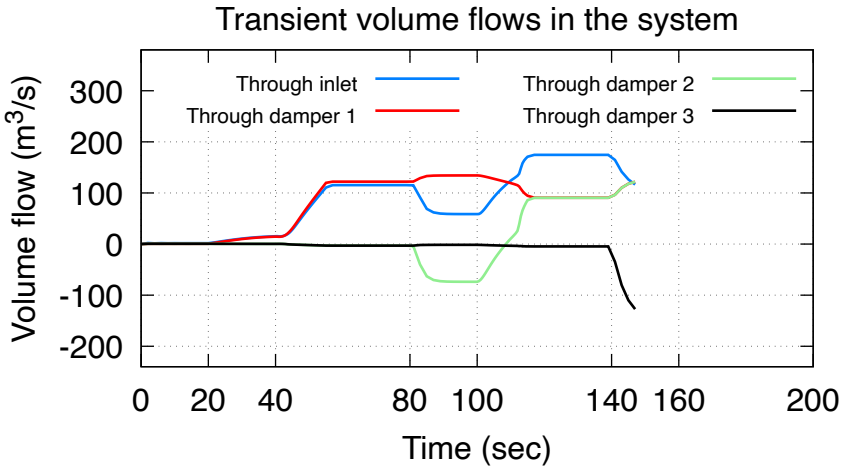

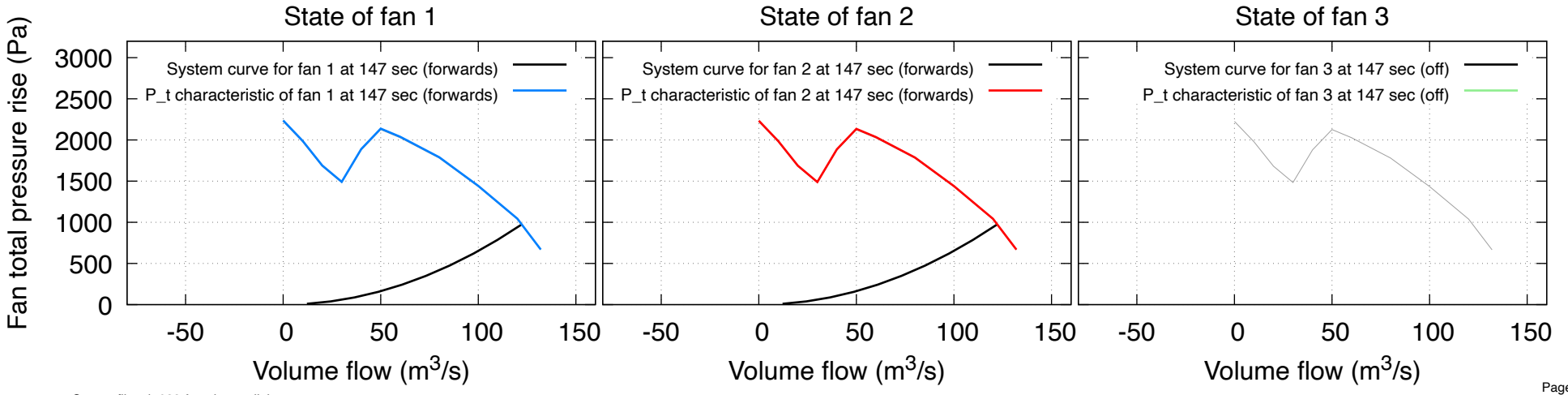

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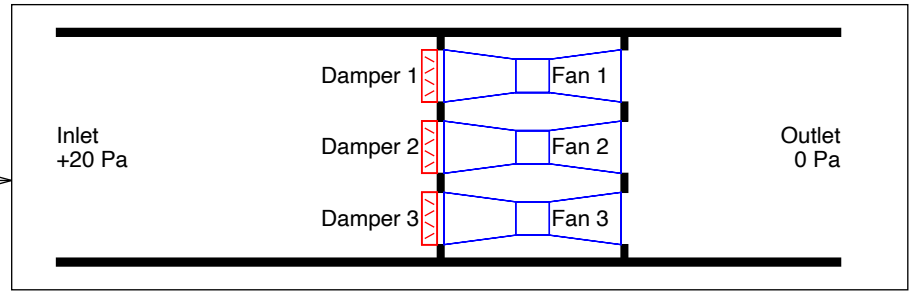

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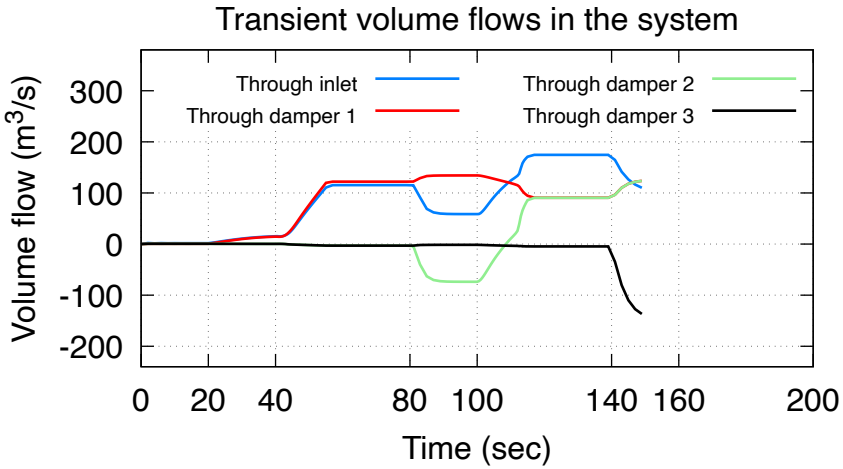

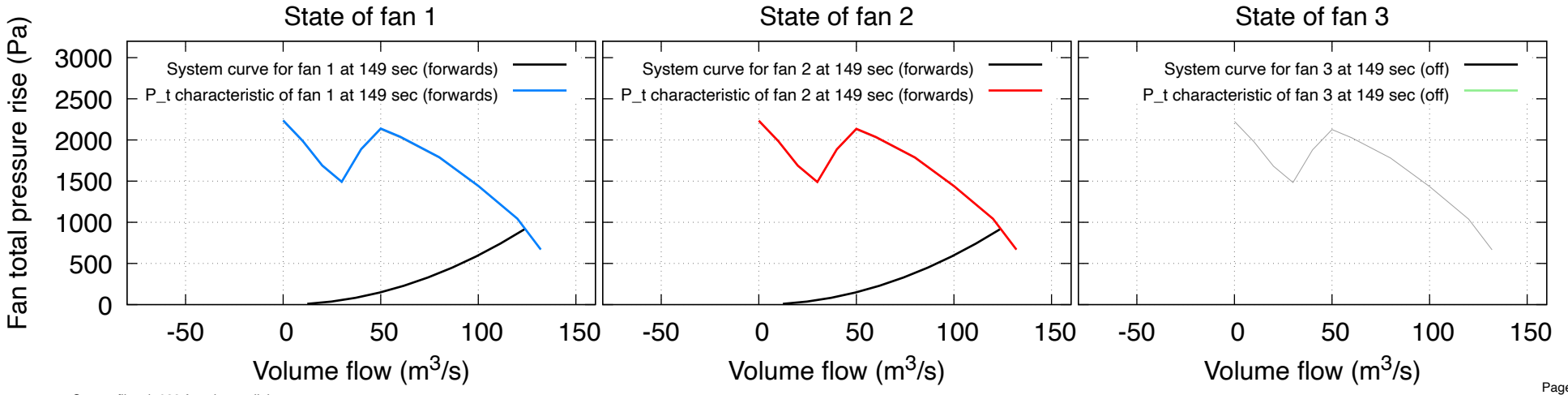

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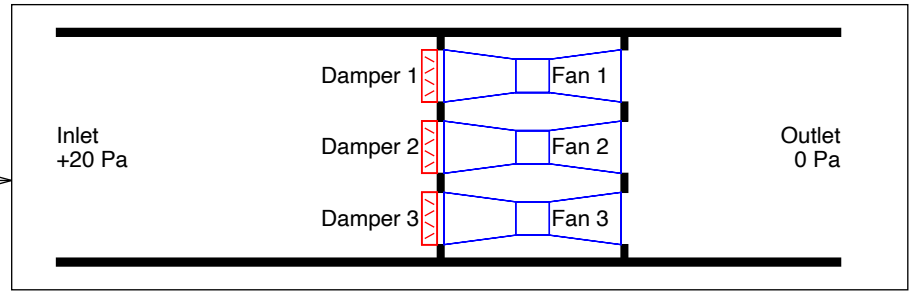

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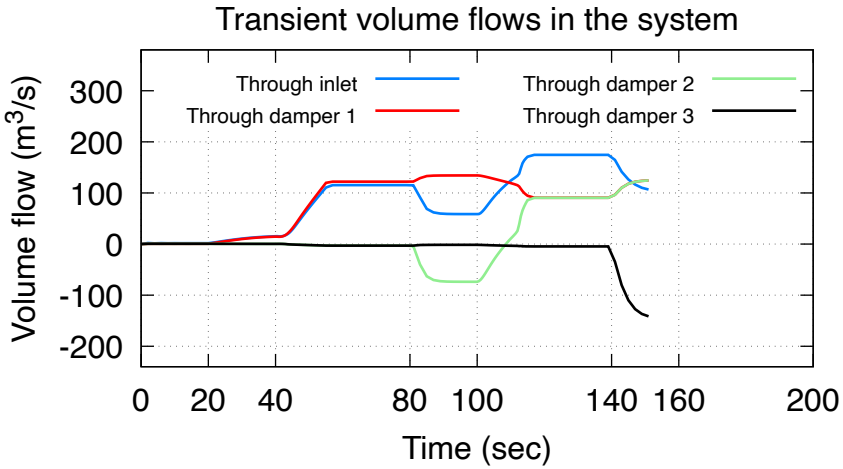

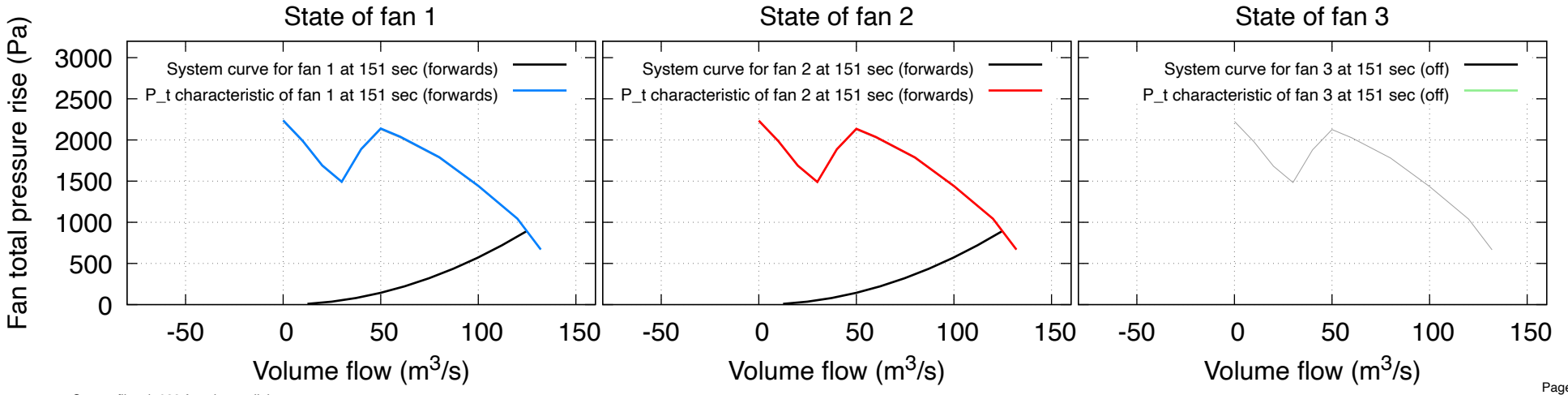

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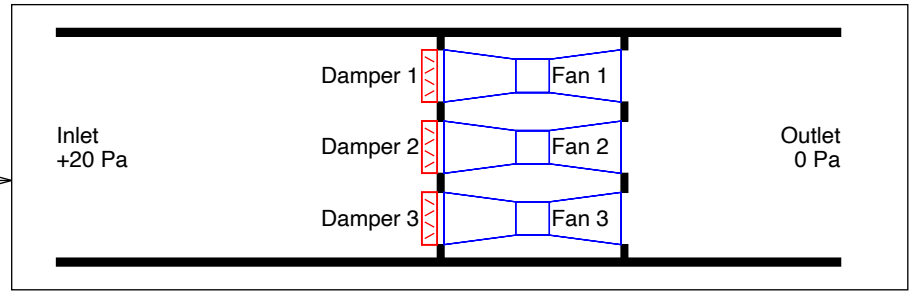

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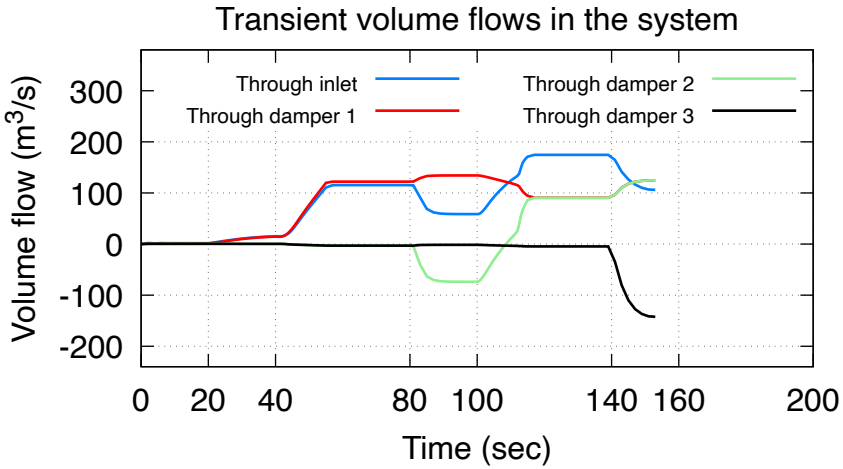

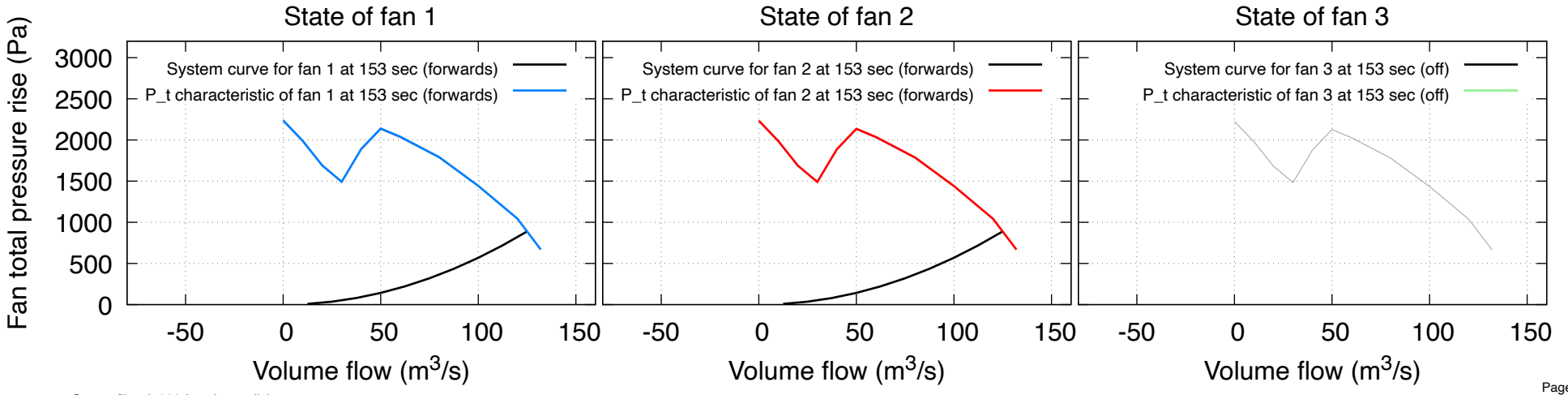

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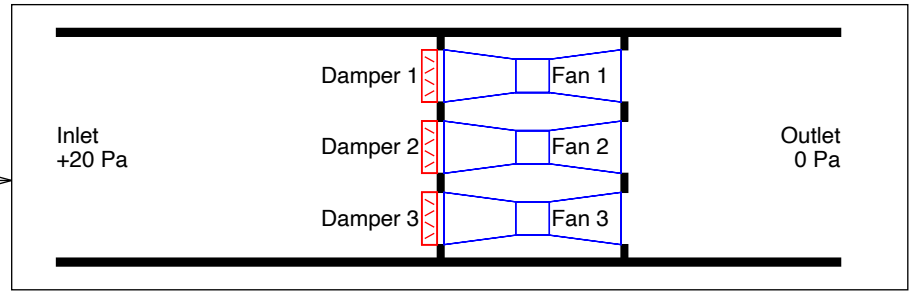

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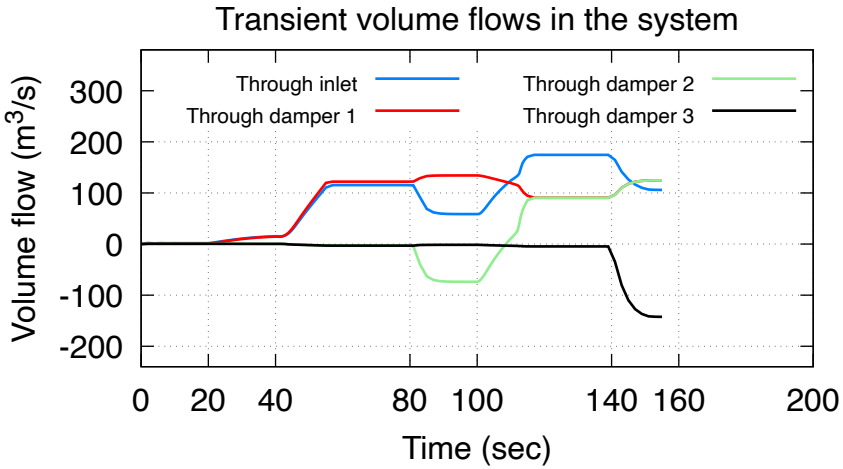

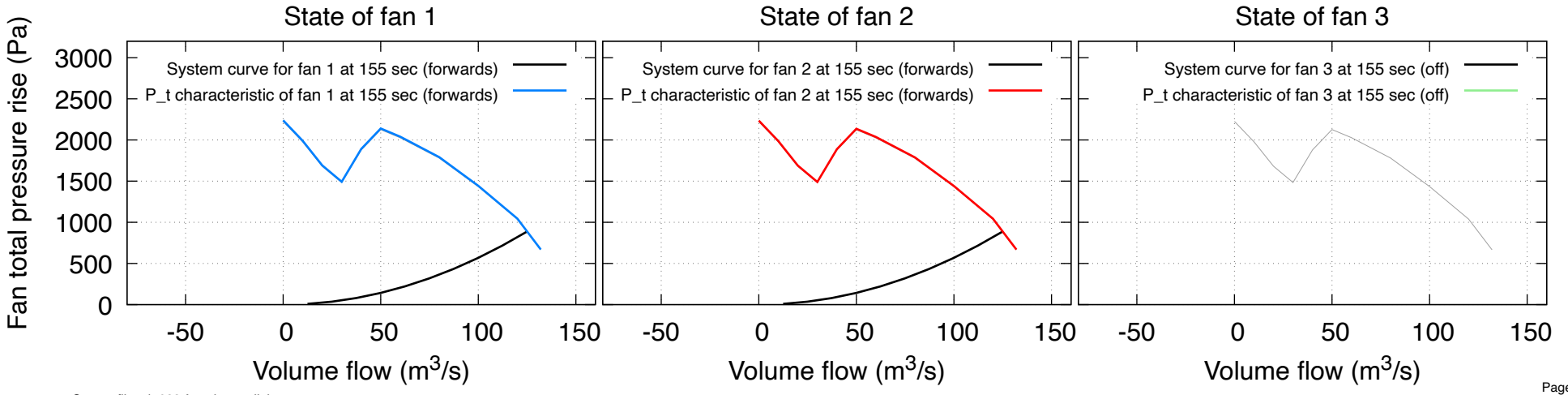

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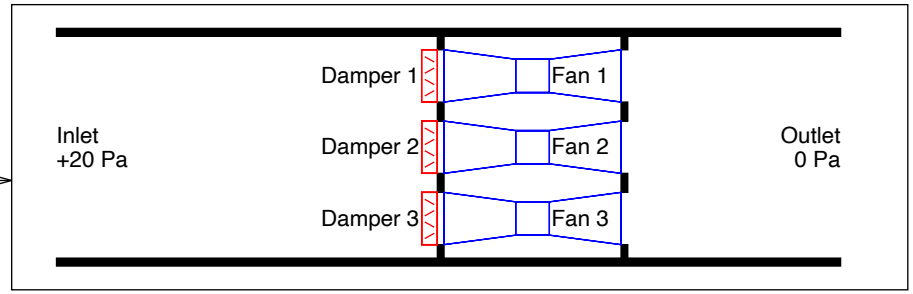

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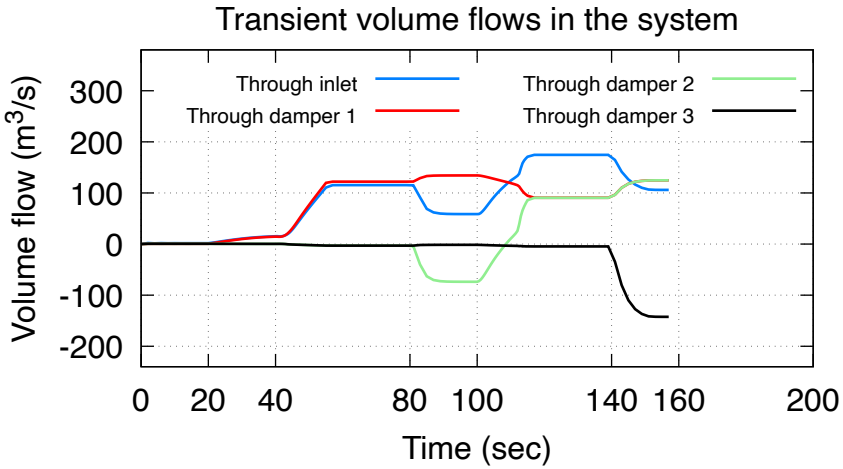

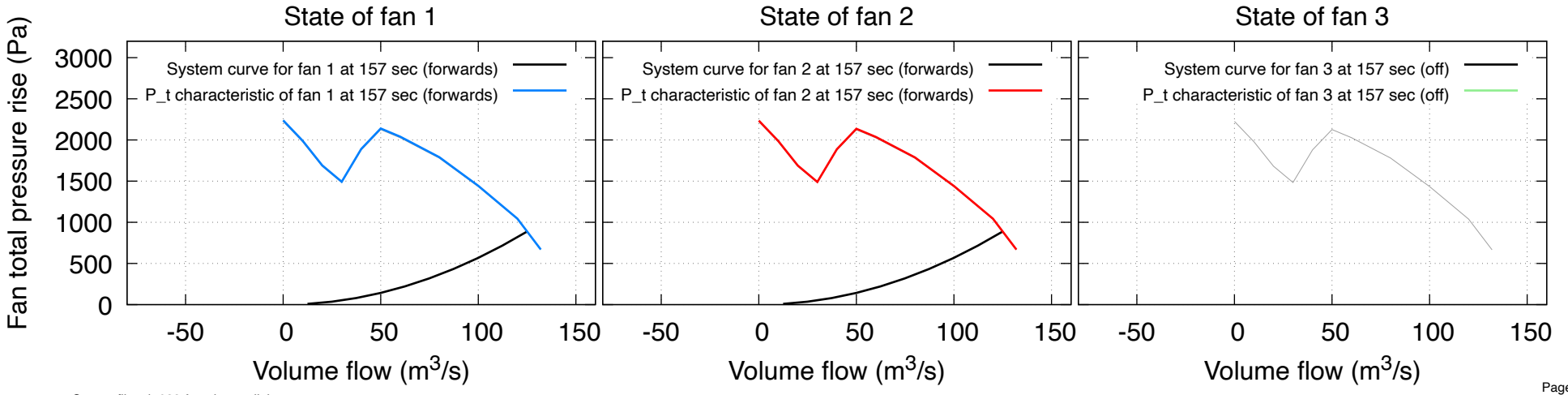

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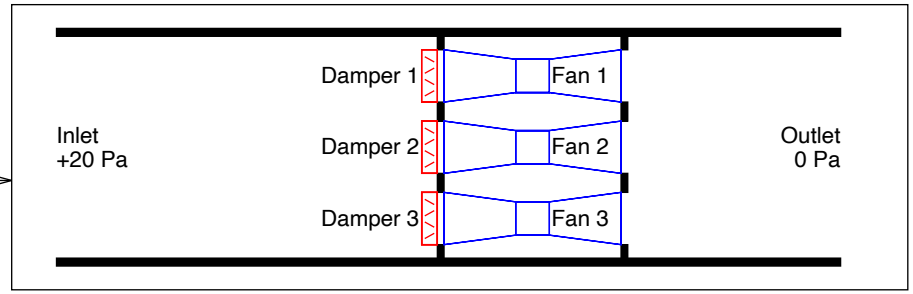

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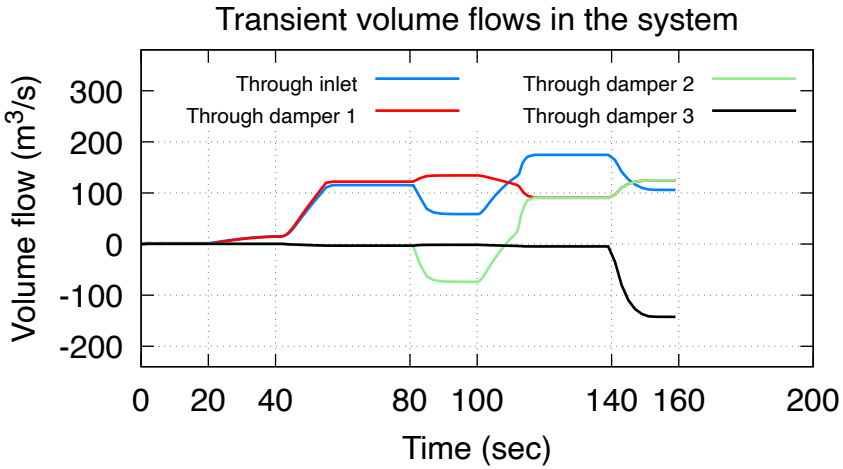

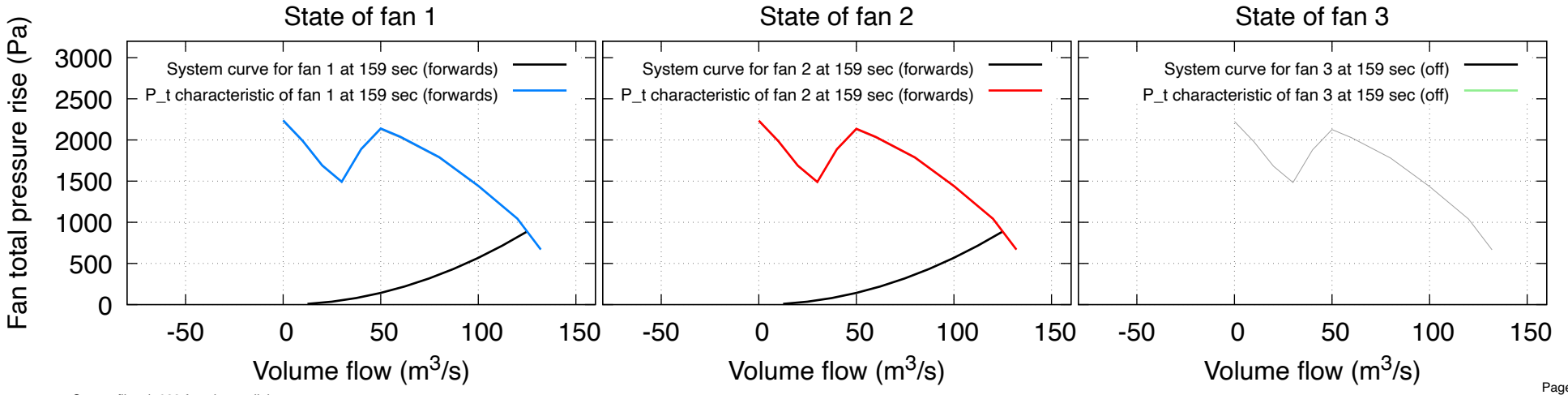

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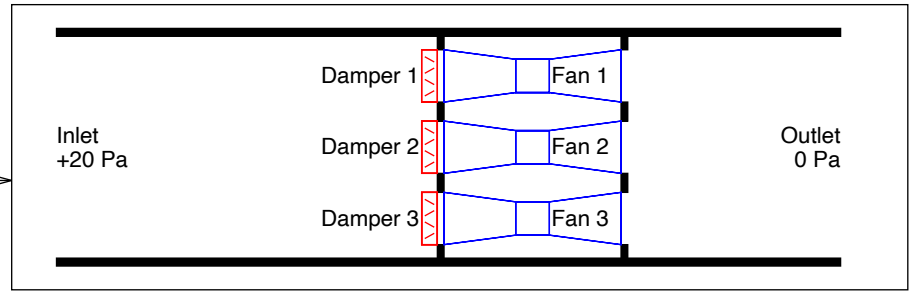

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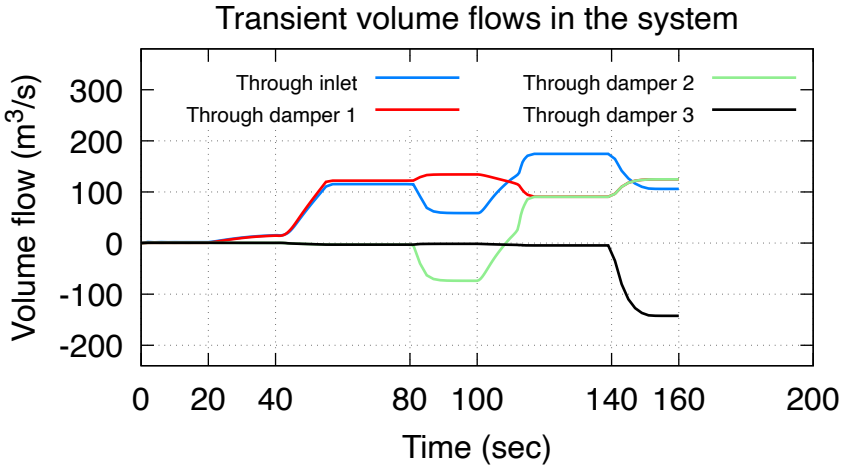

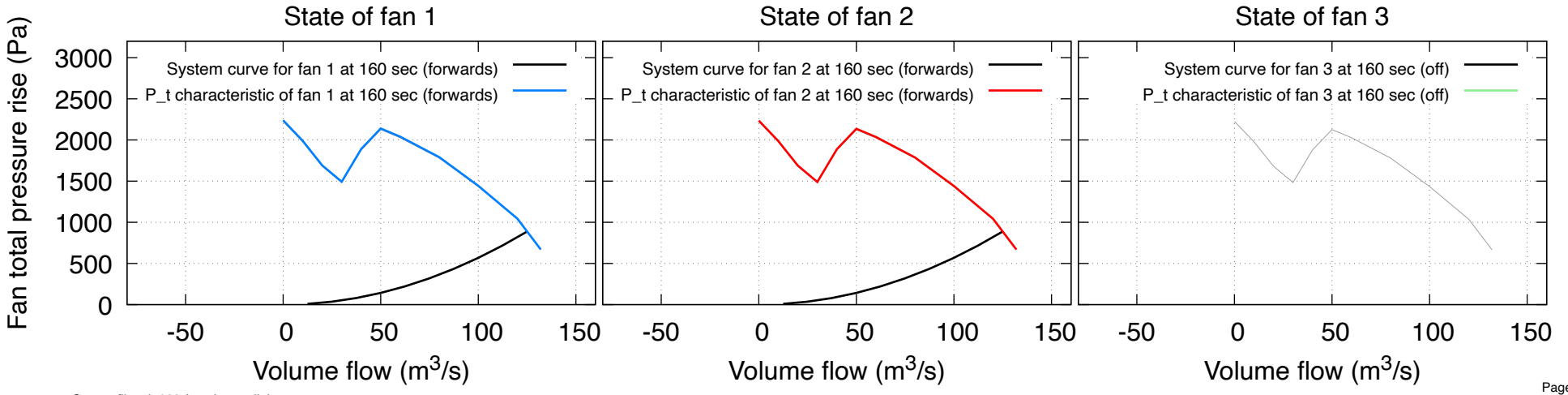

Source file: ok-032-fans-in-parallel.txt.

Created by Hobyah.py from ok-032-fans-in-parallel.txt, 16:50 on 14 Jul 2023 by tester

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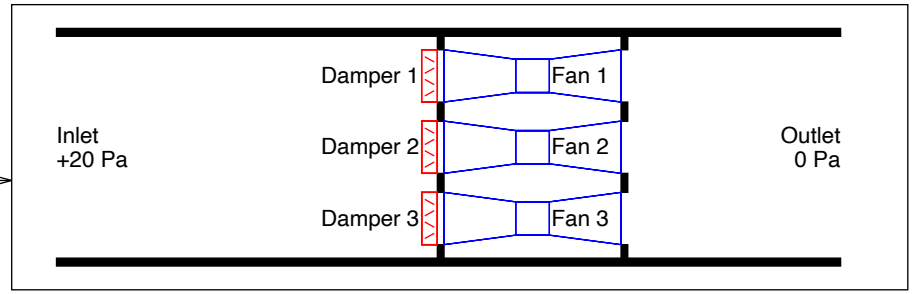

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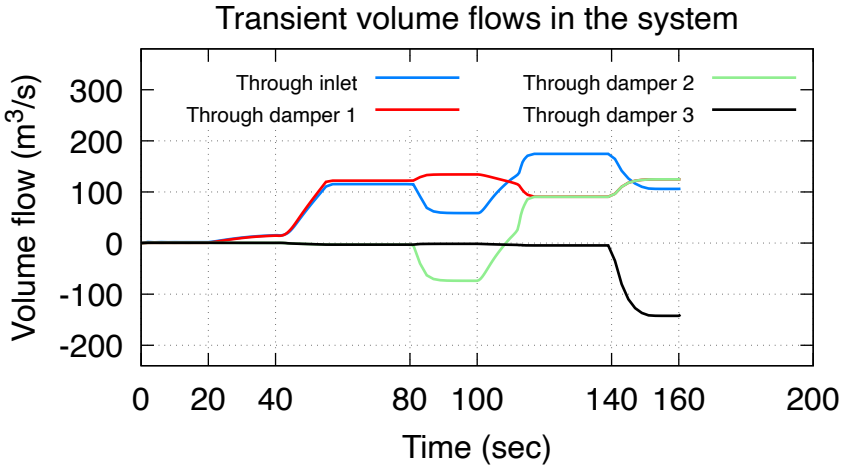

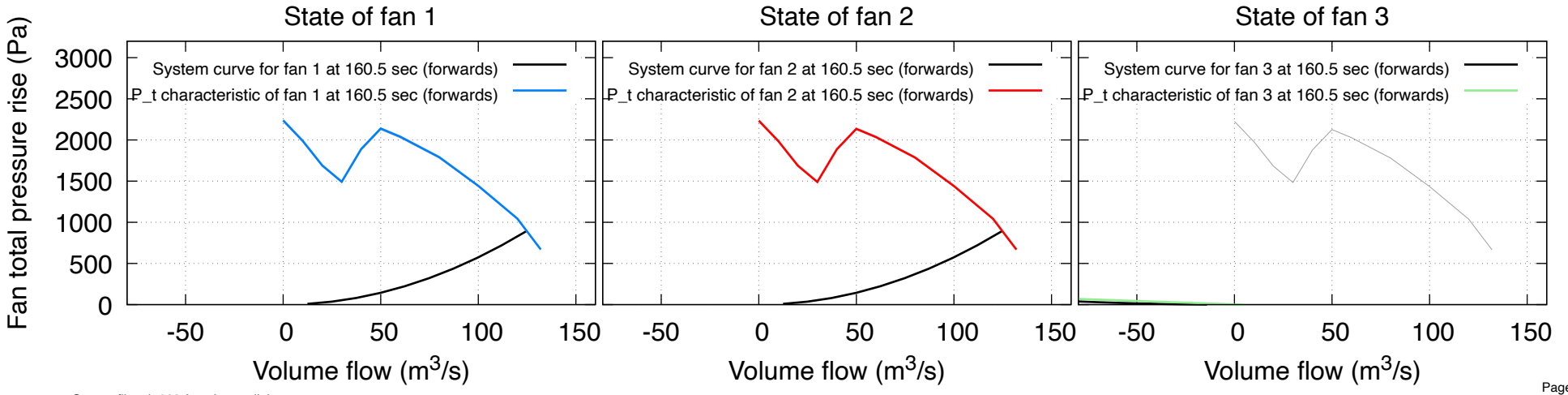

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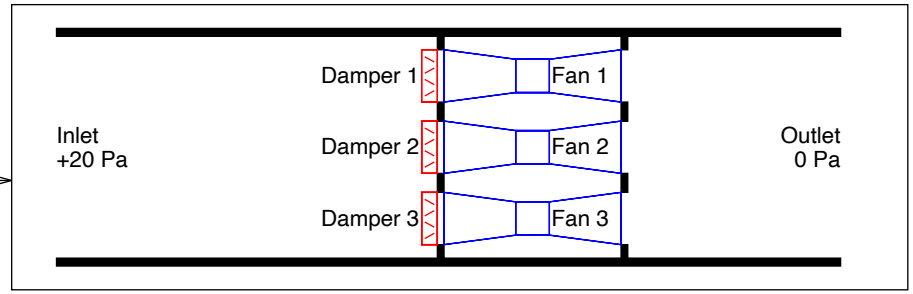

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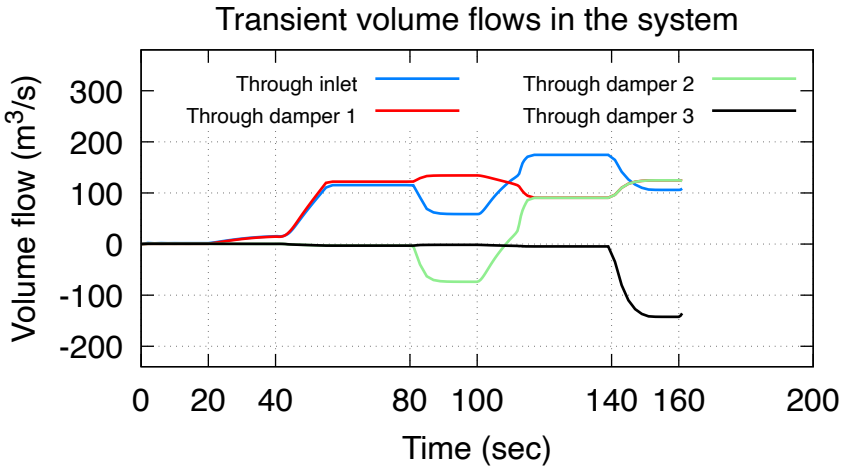

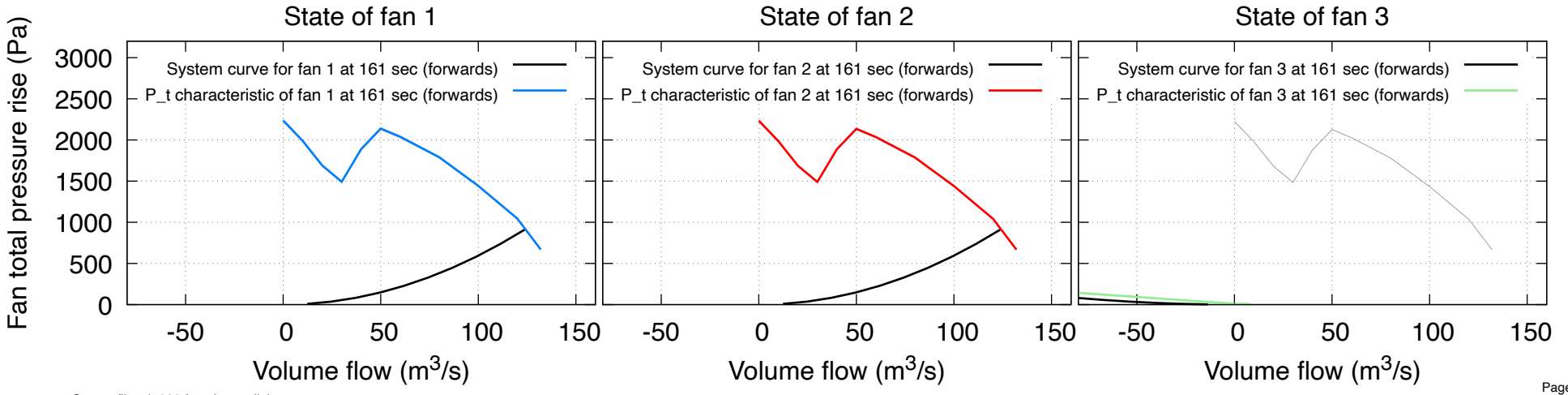

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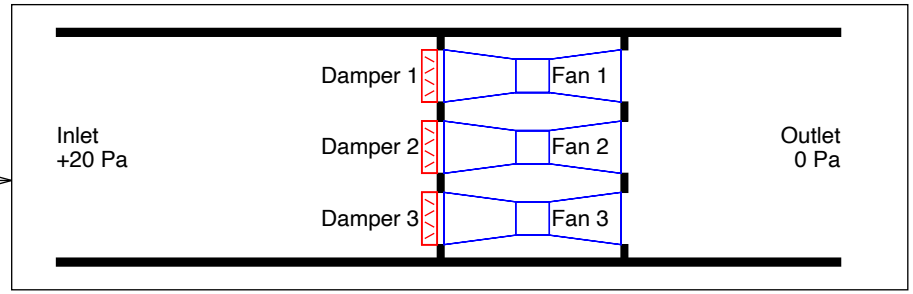

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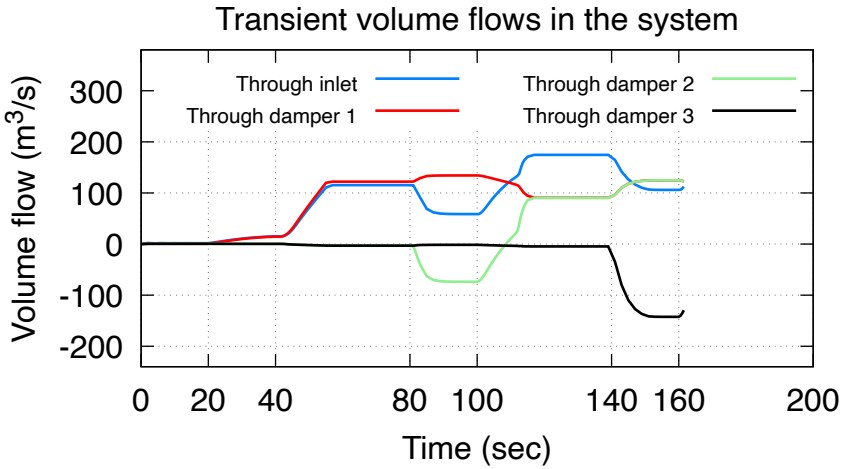

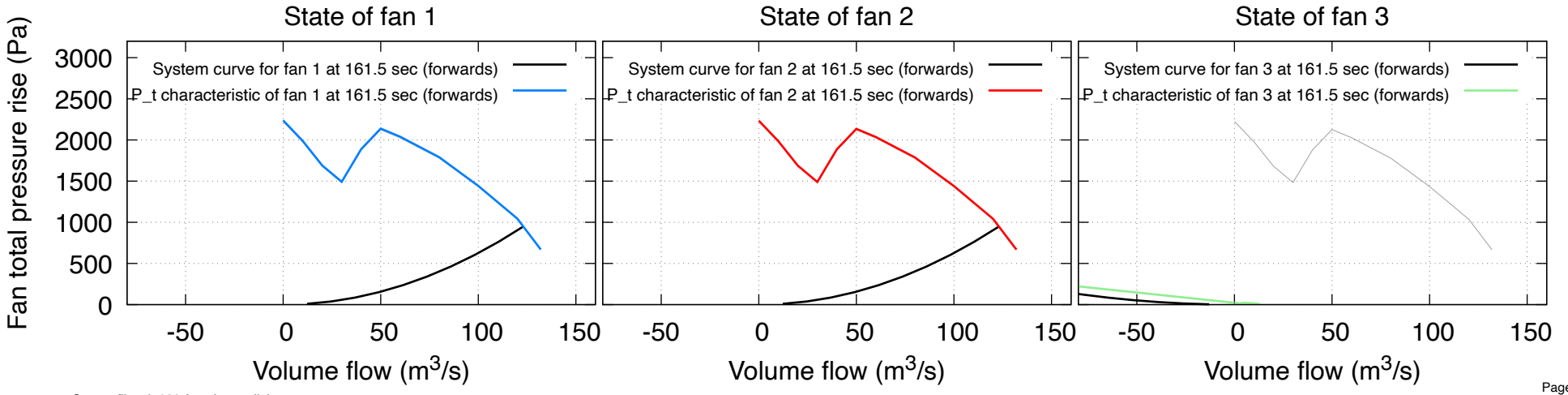

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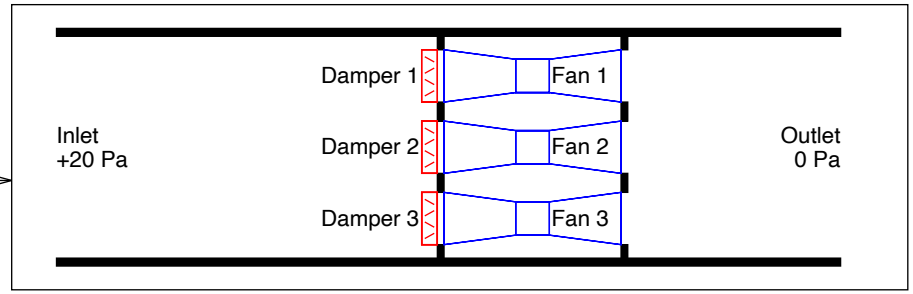

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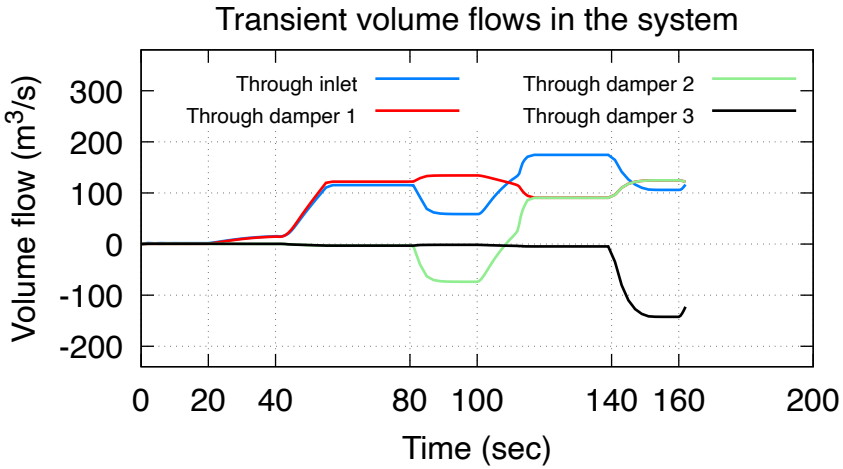

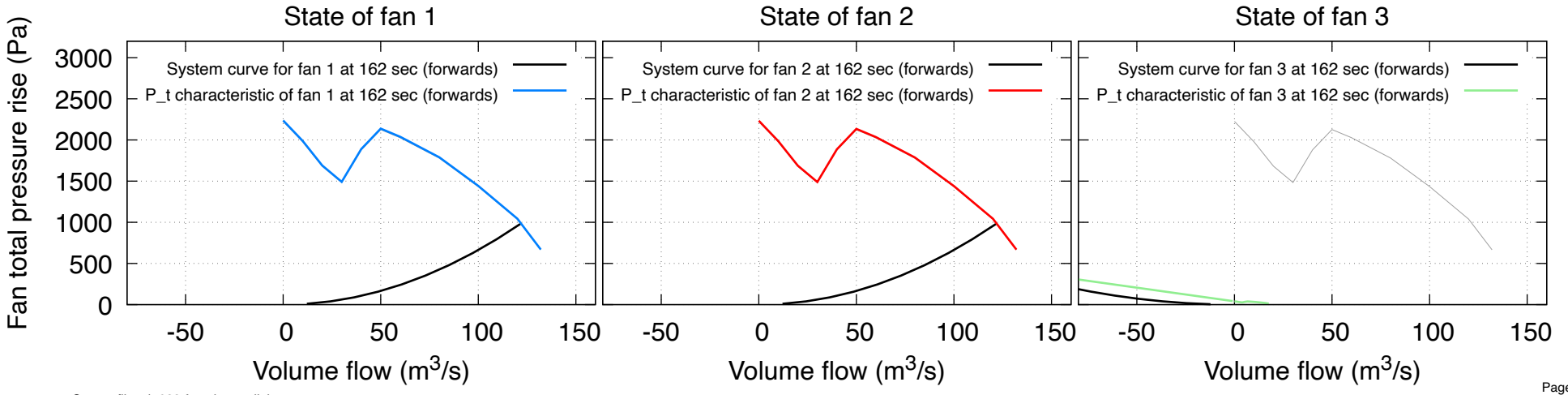

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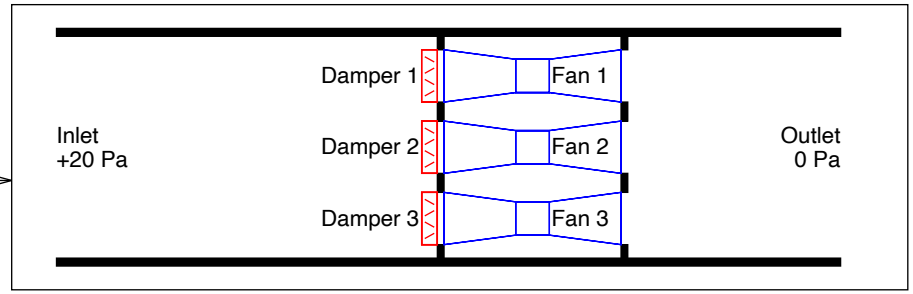

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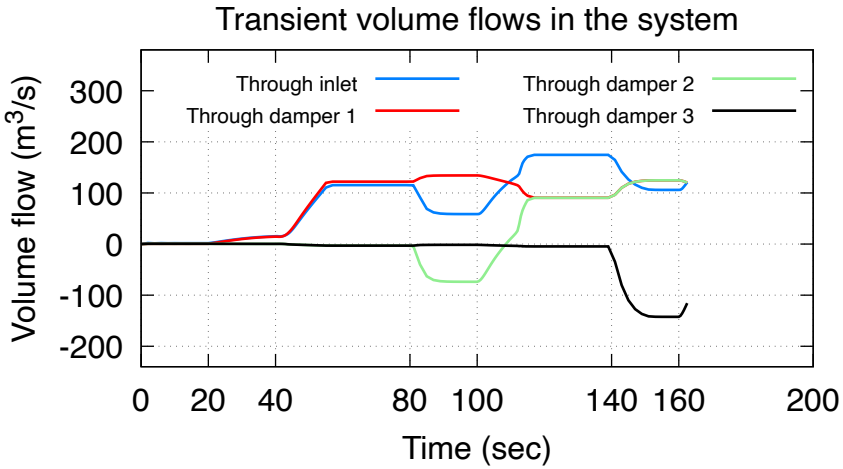

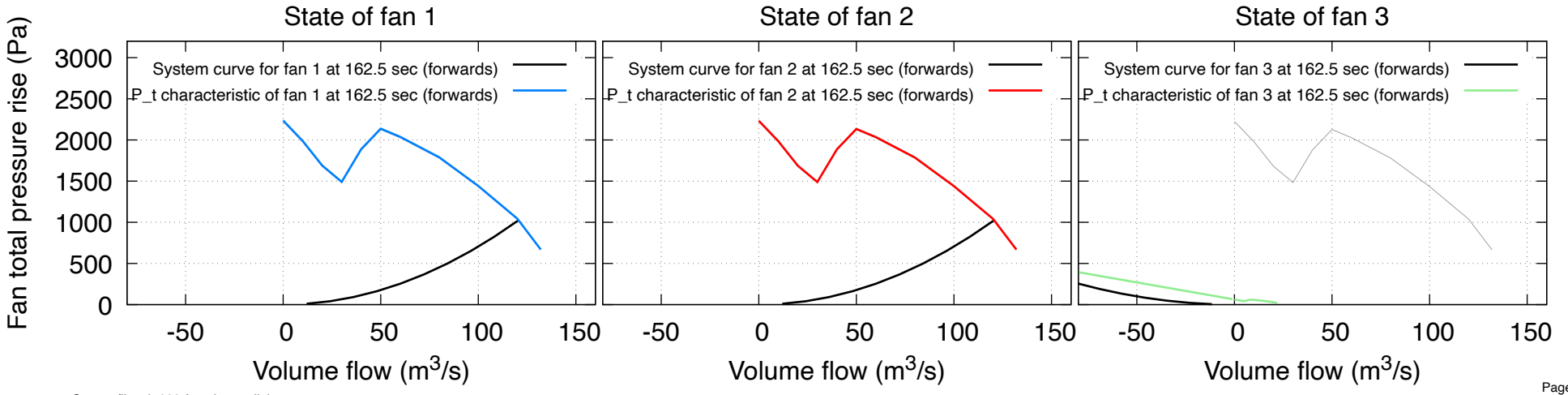

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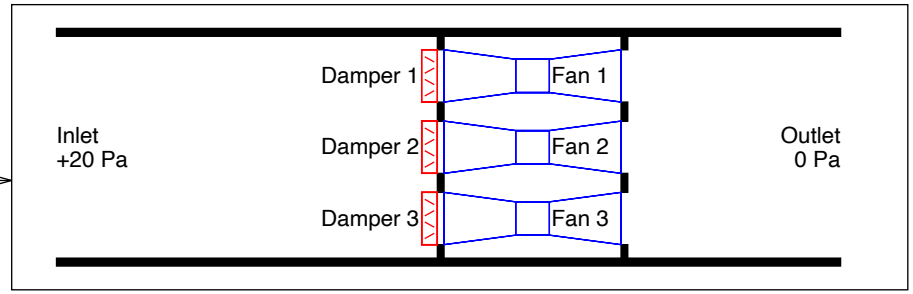

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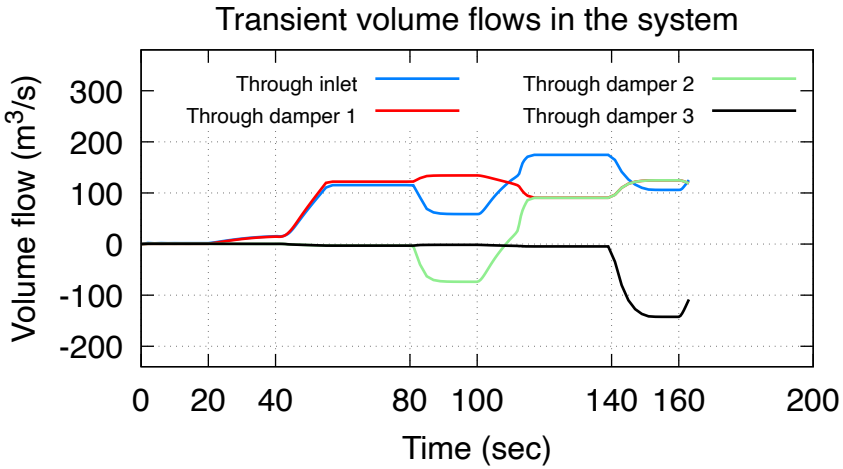

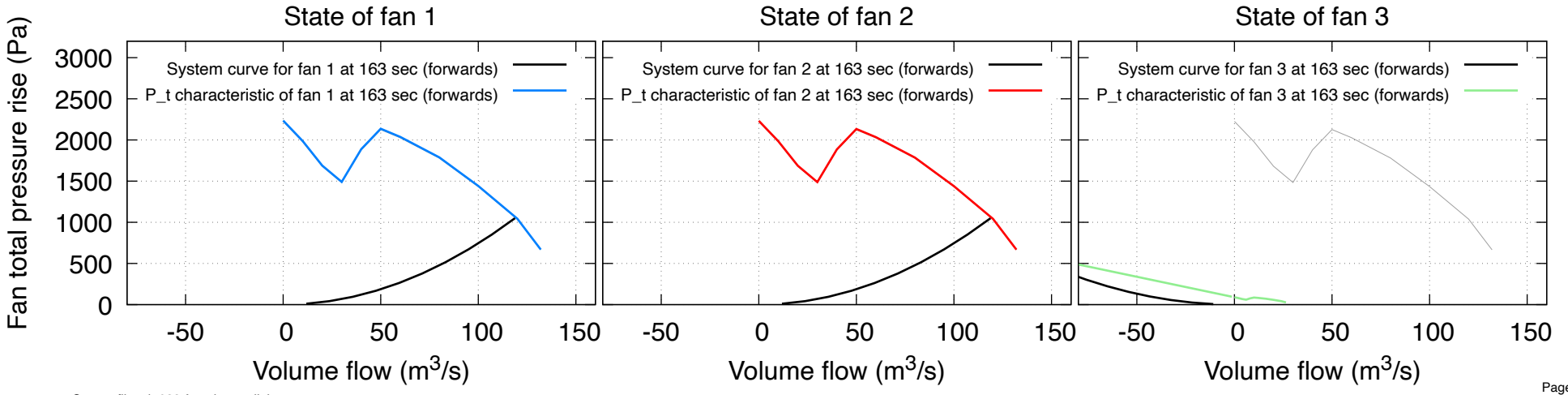

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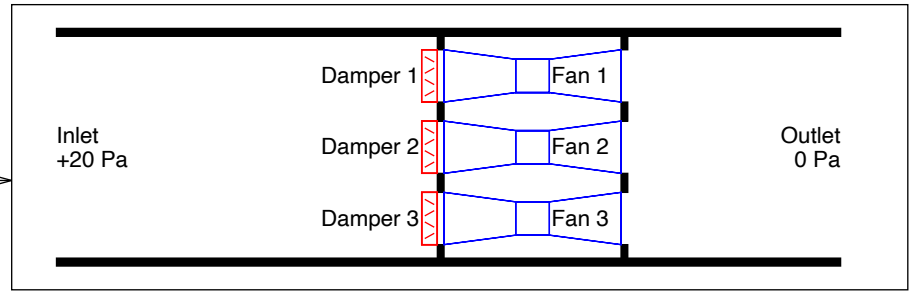

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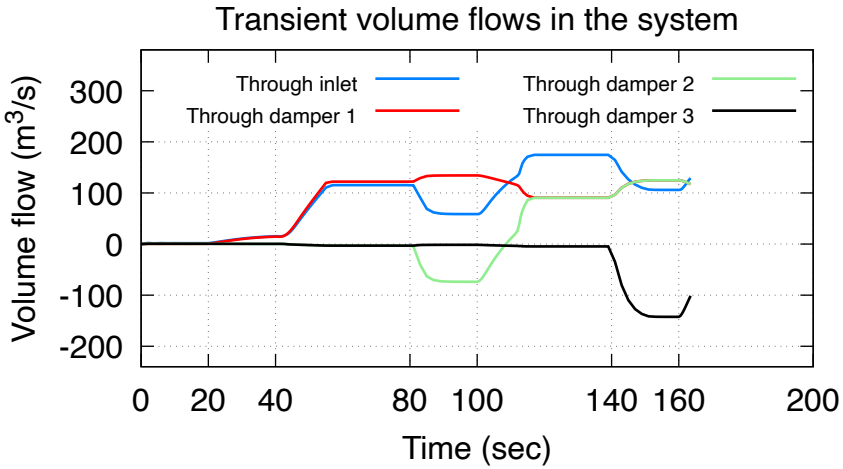

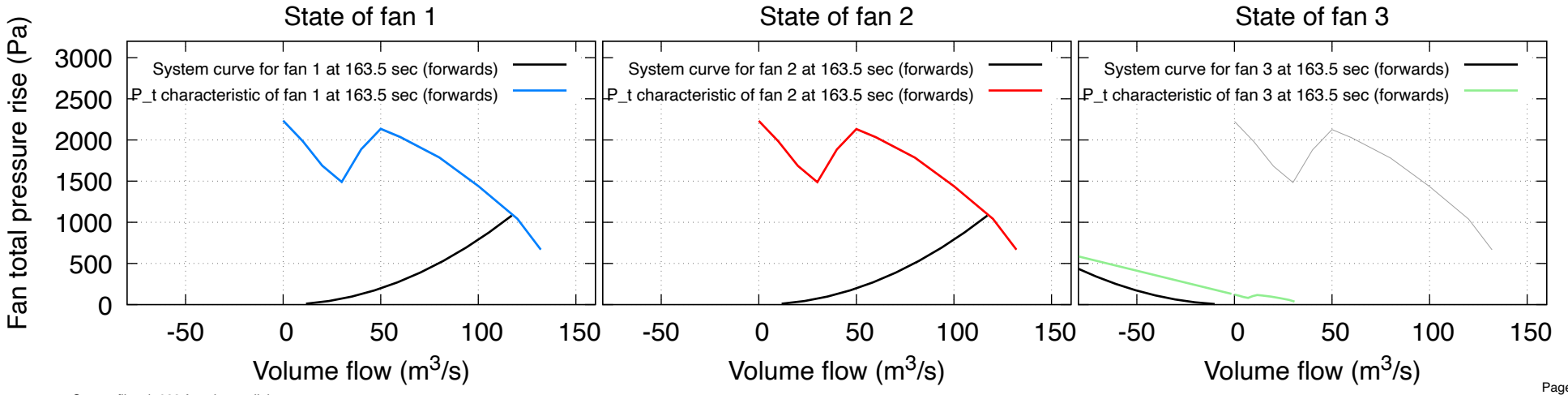

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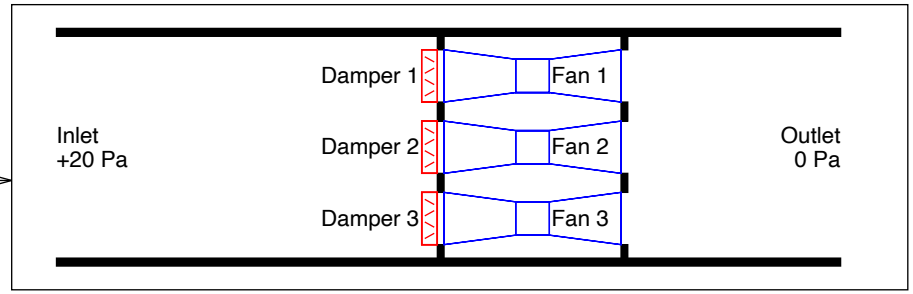

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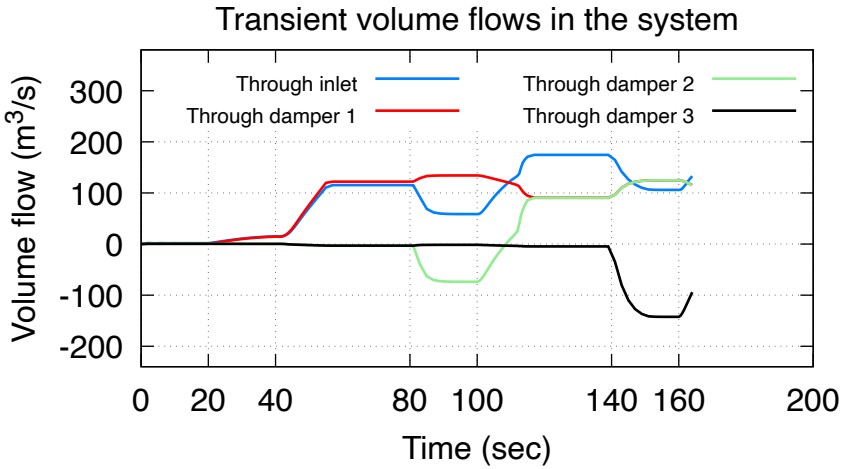

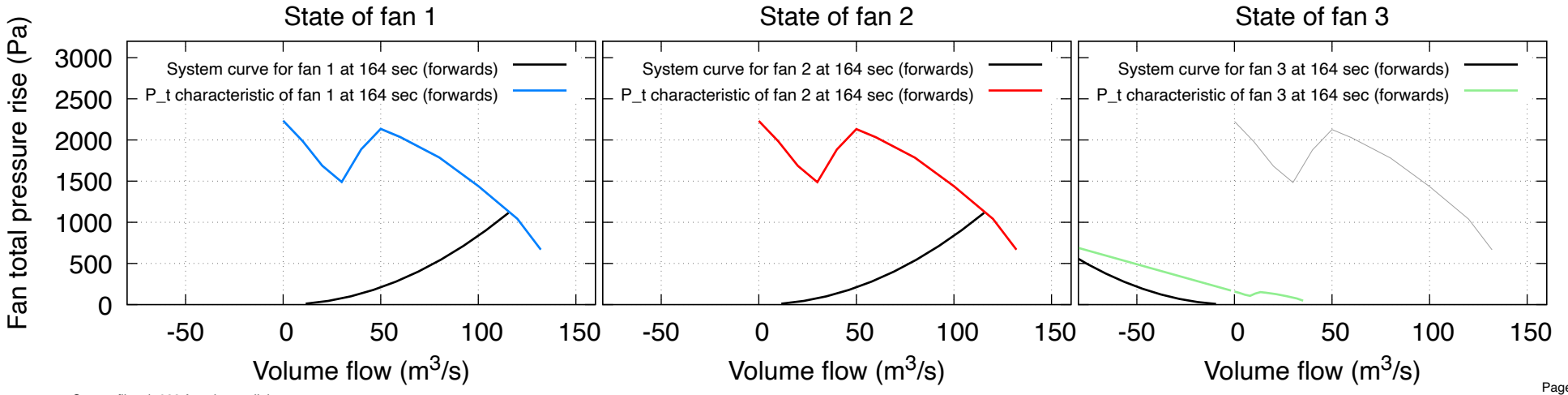

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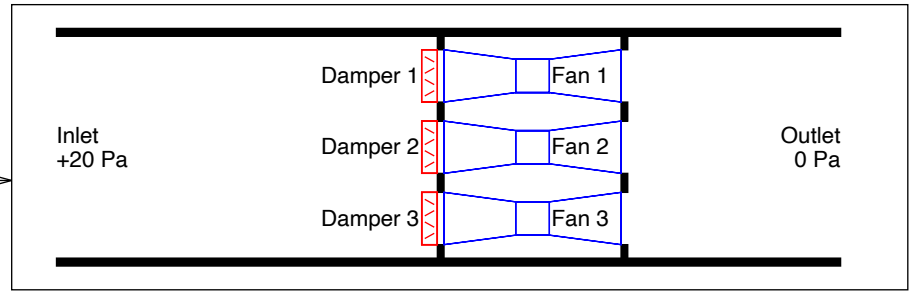

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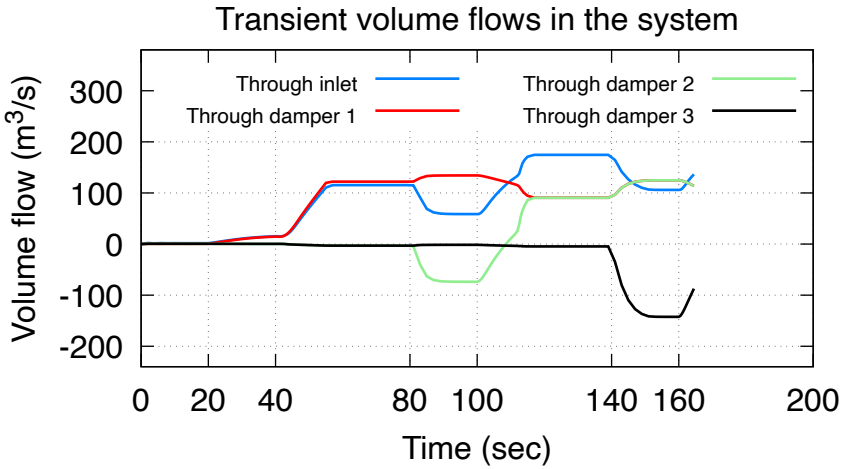

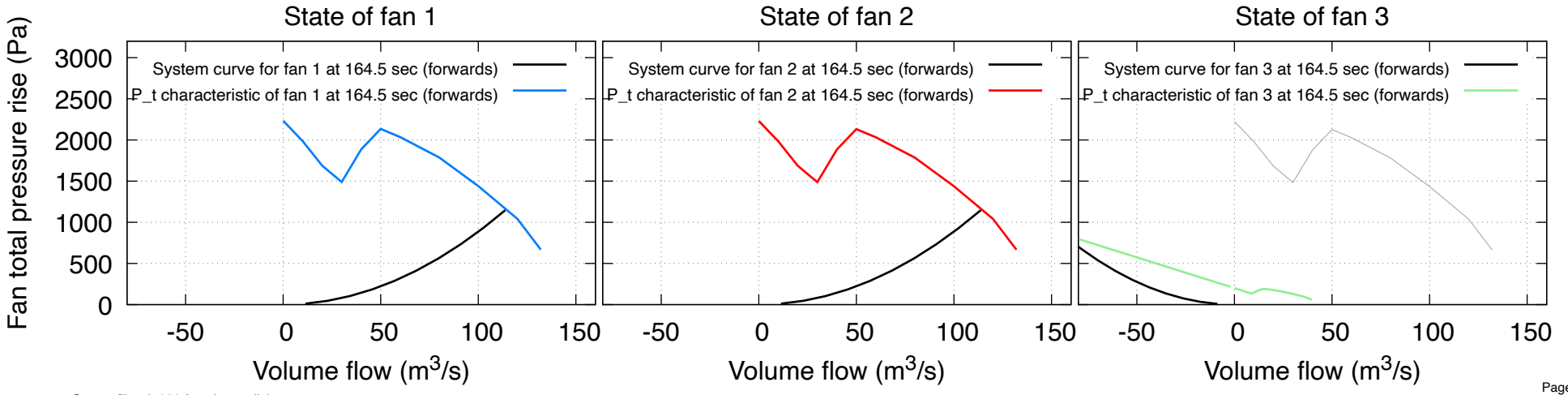

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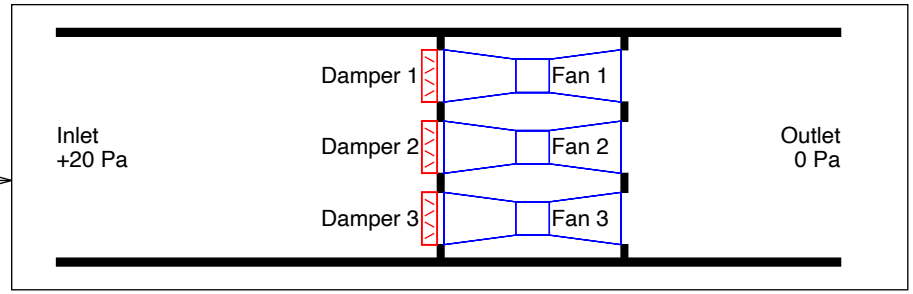

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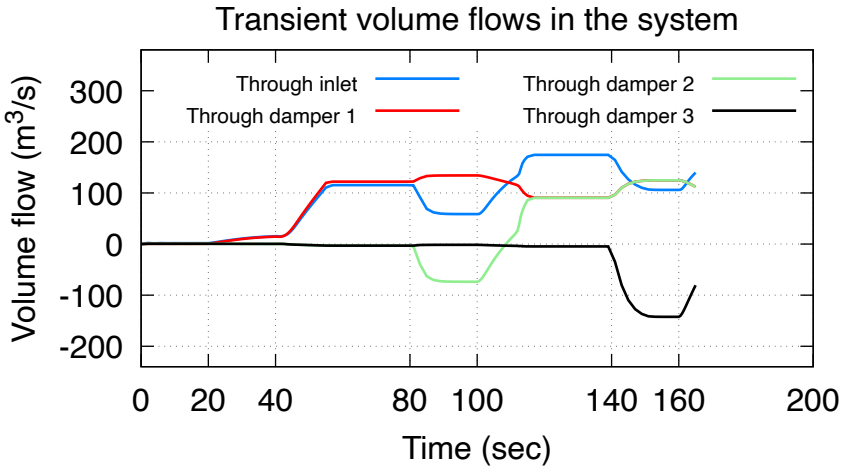

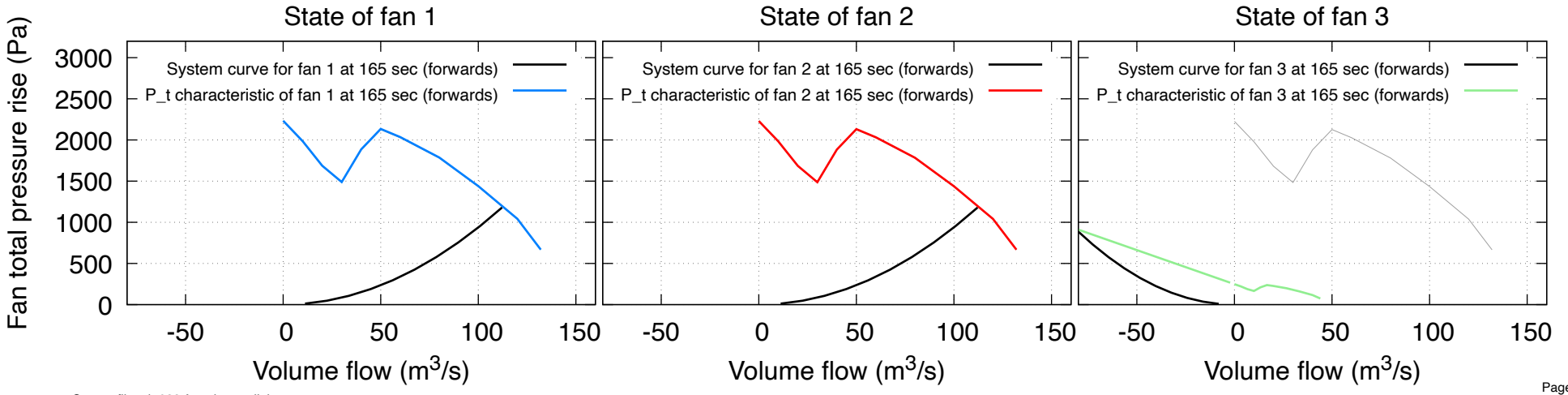

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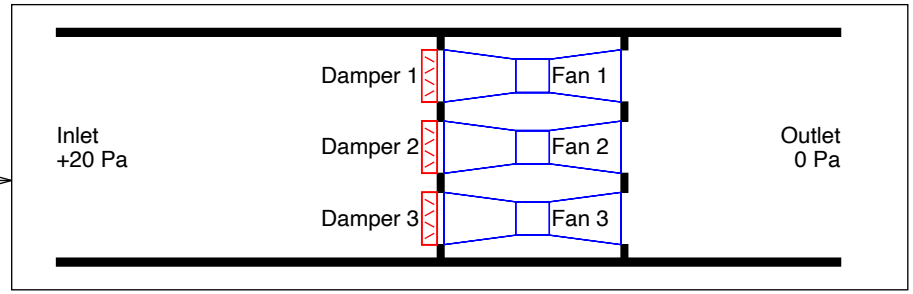

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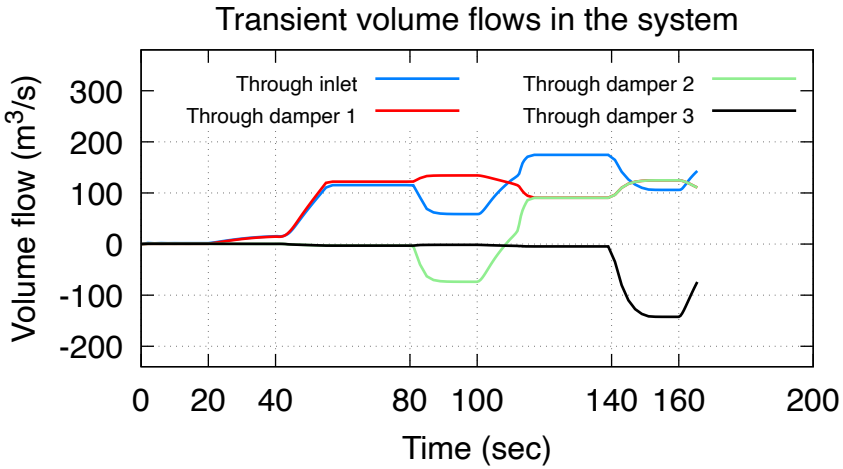

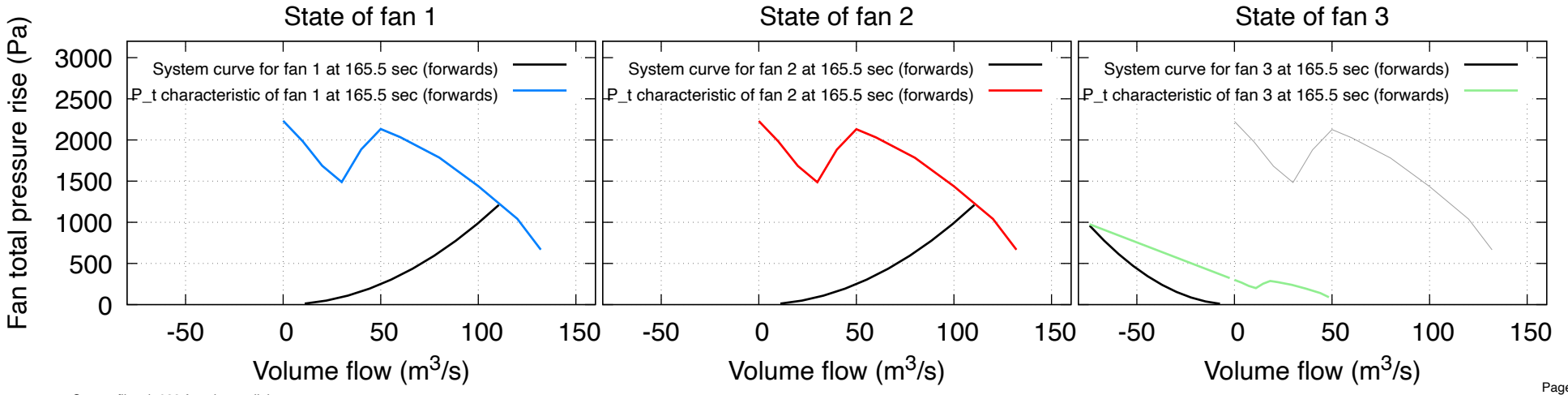

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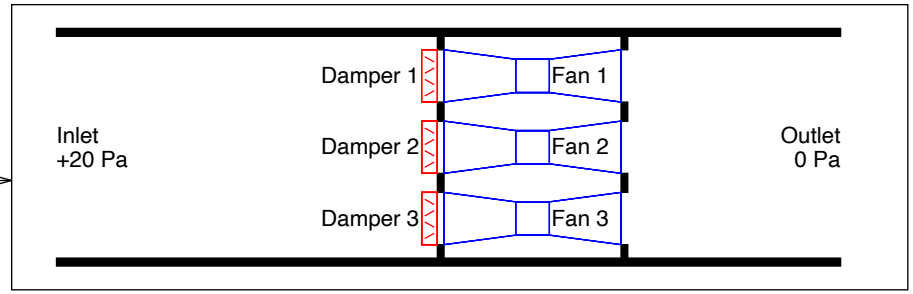

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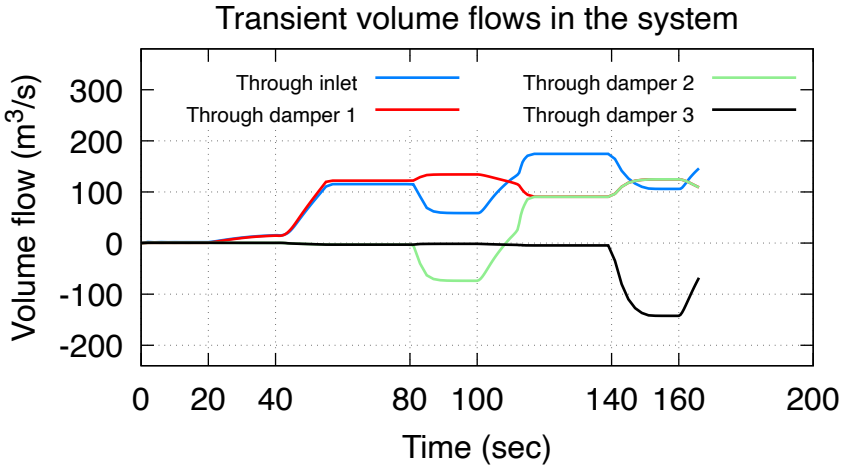

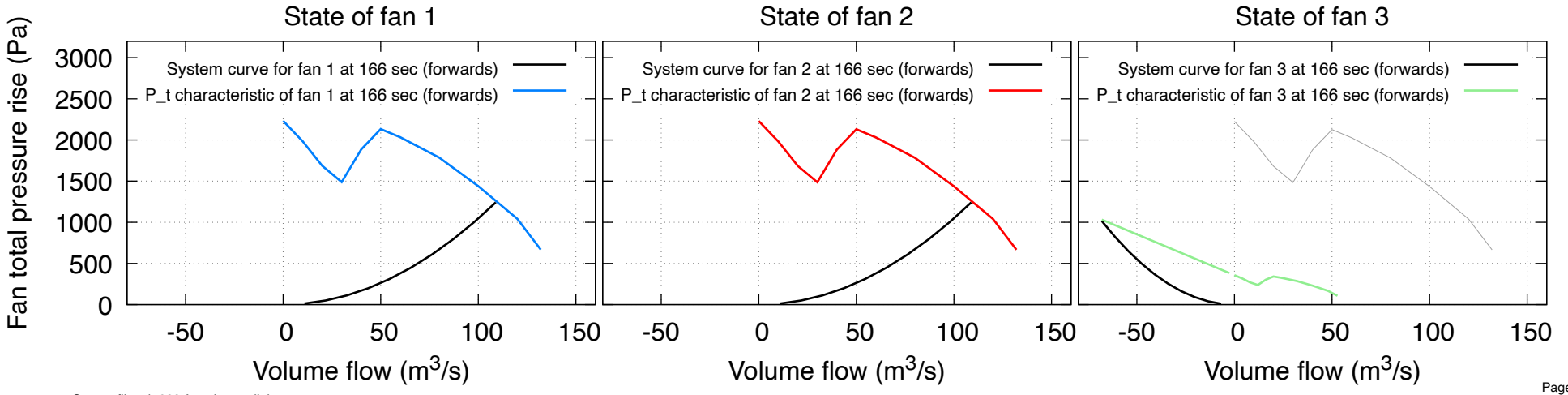

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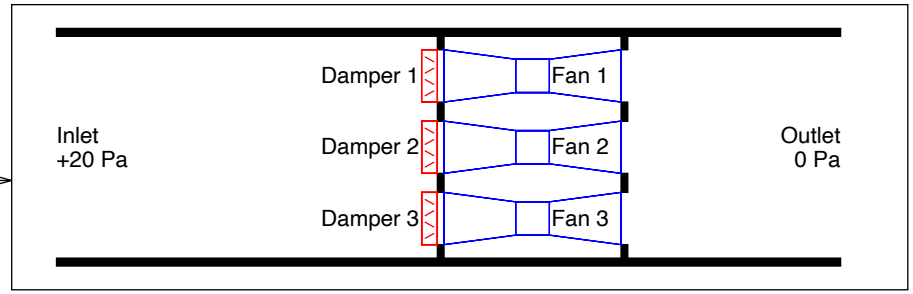

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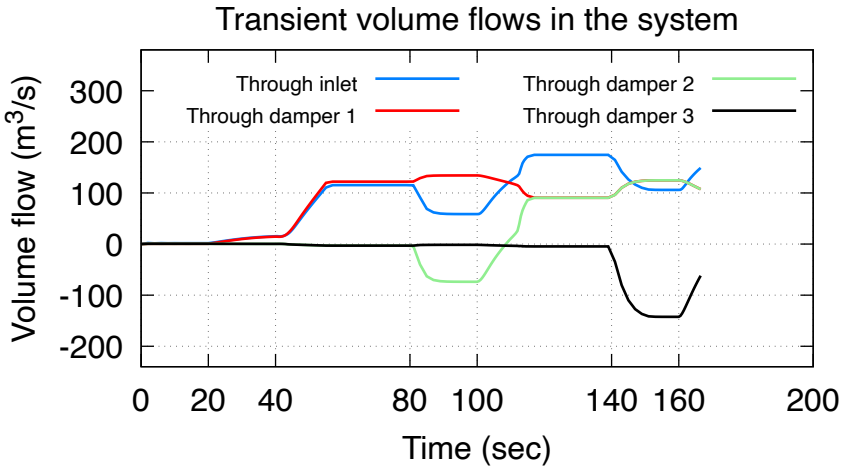

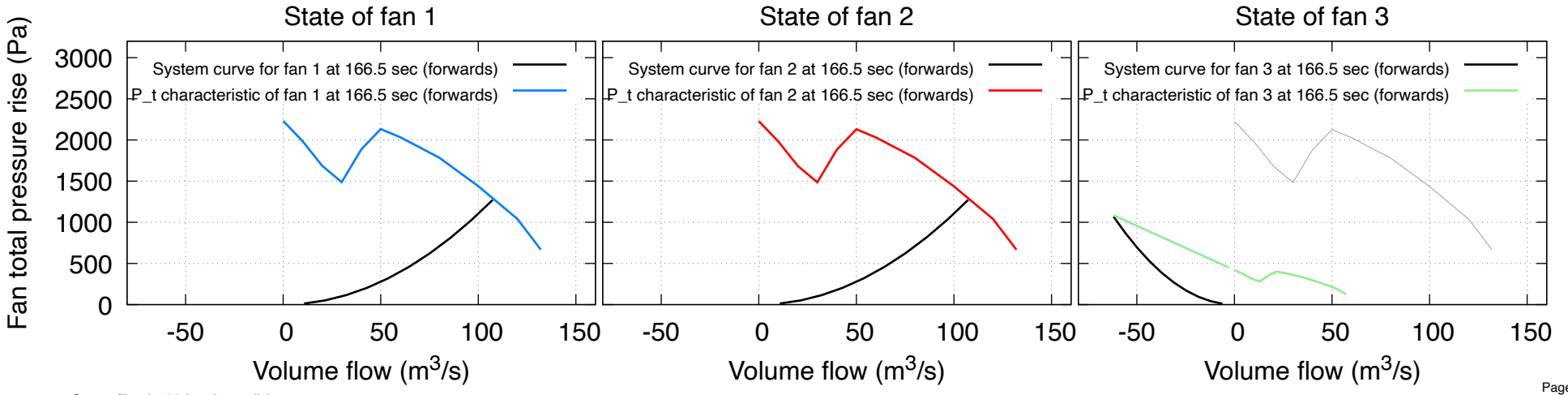

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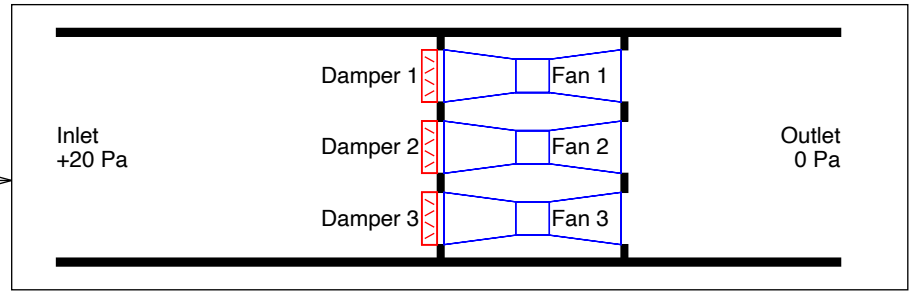

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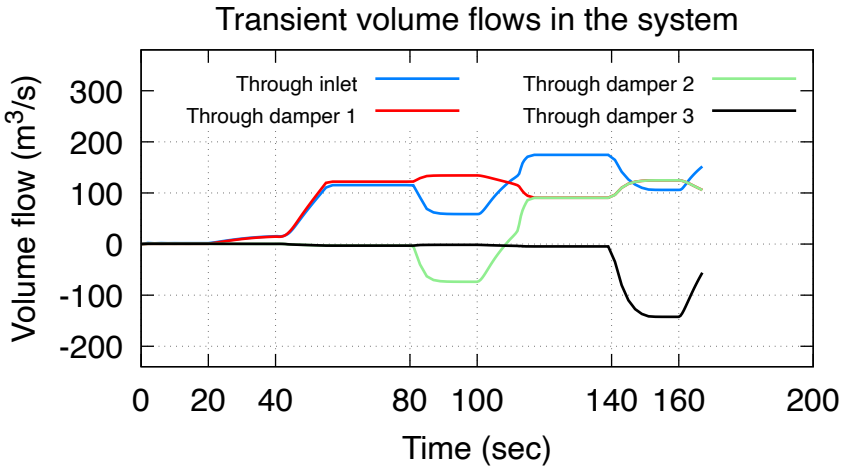

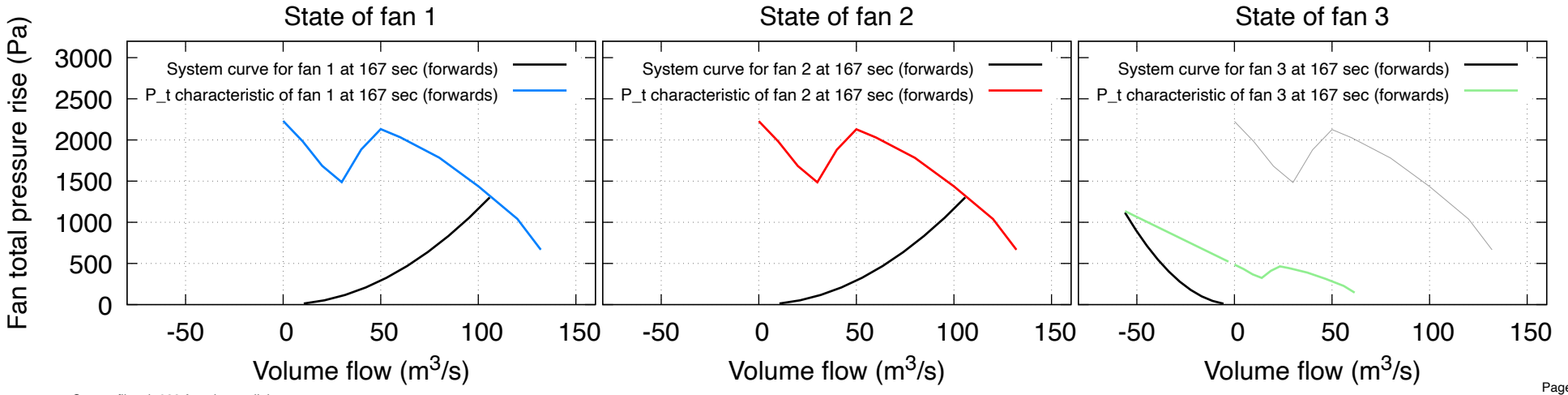

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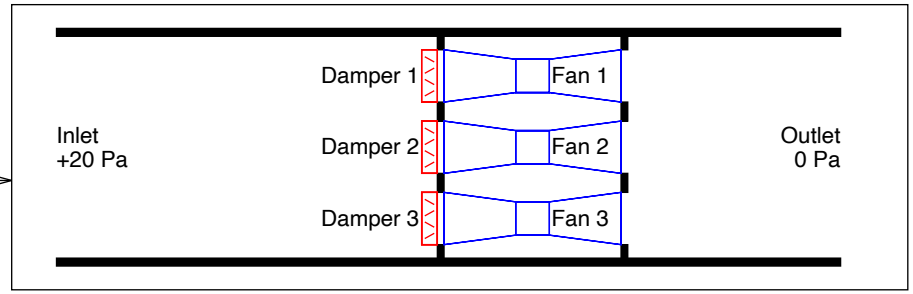

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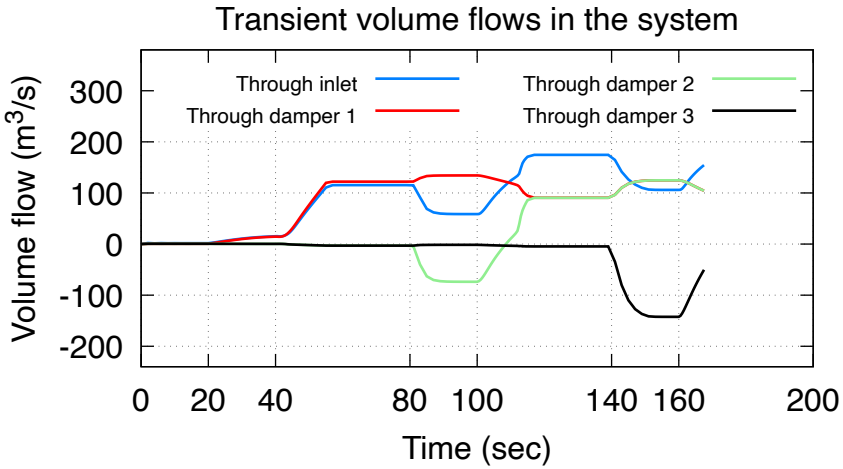

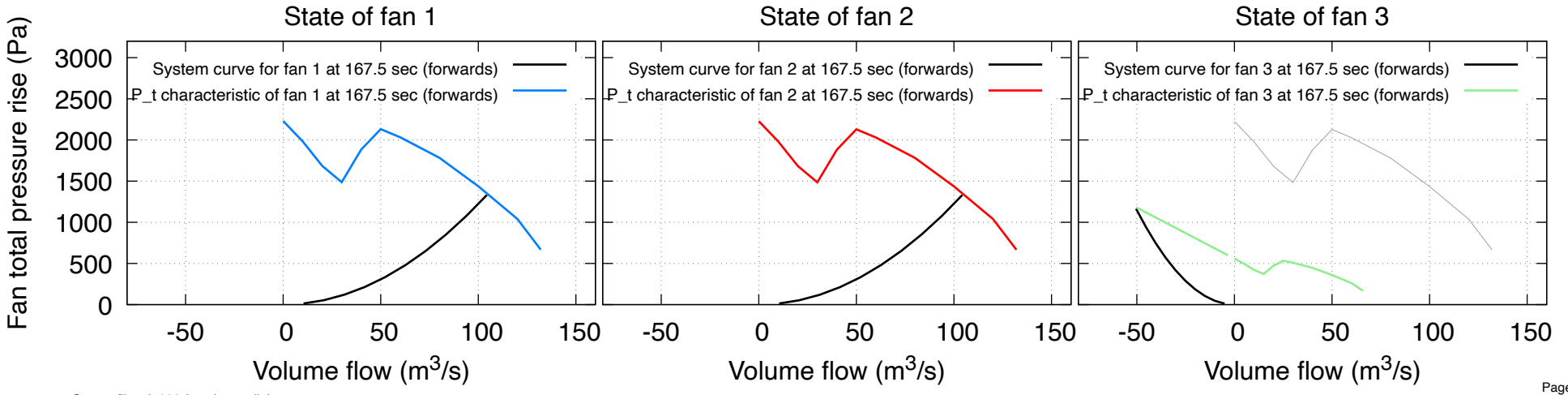

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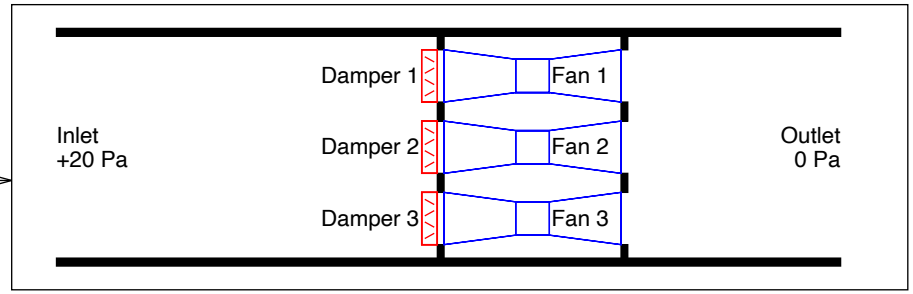

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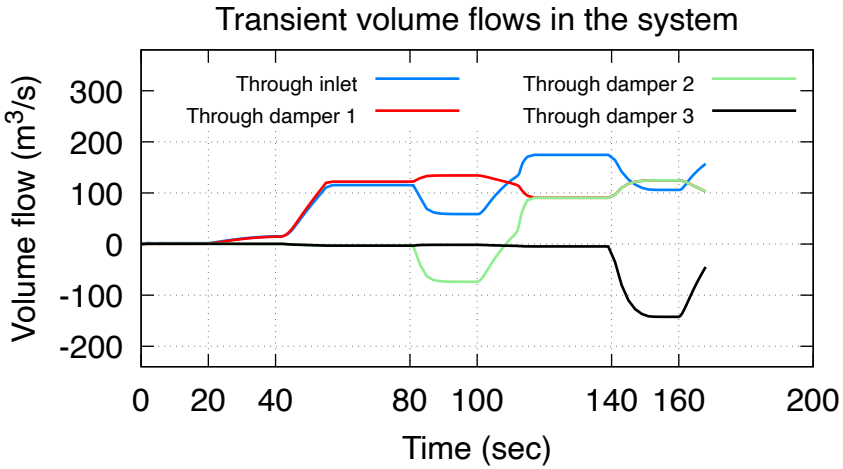

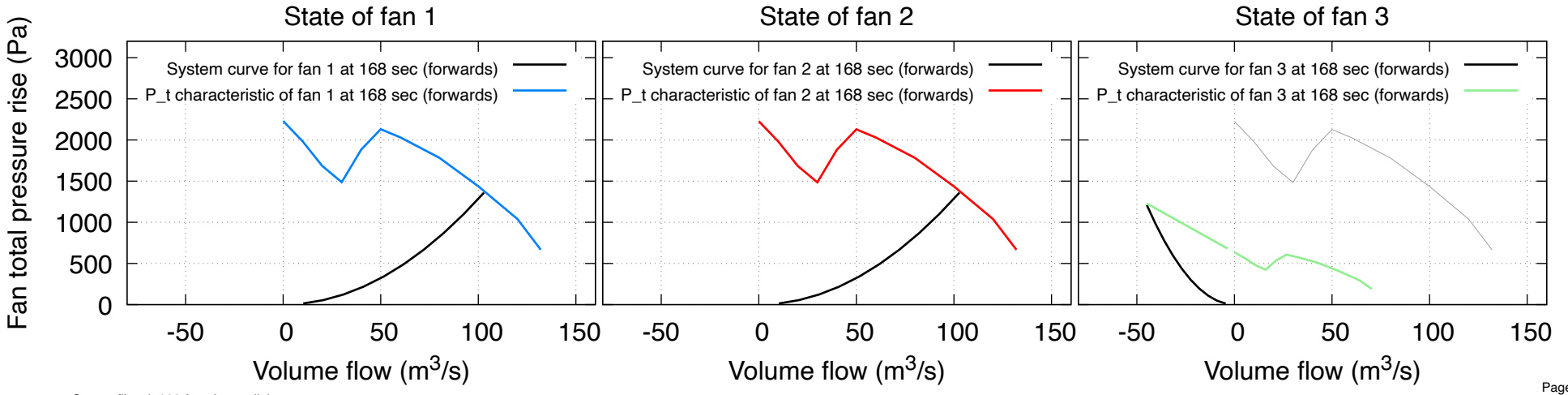

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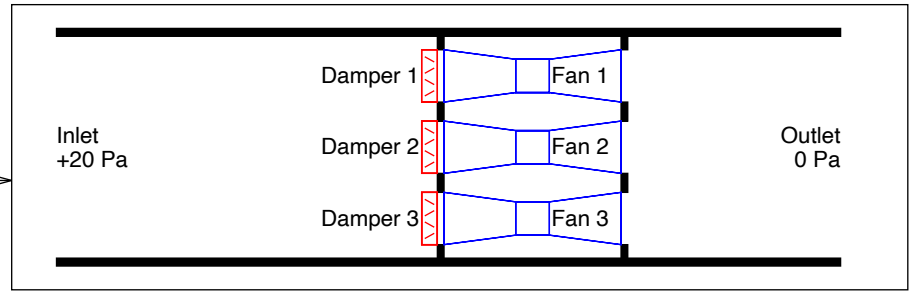

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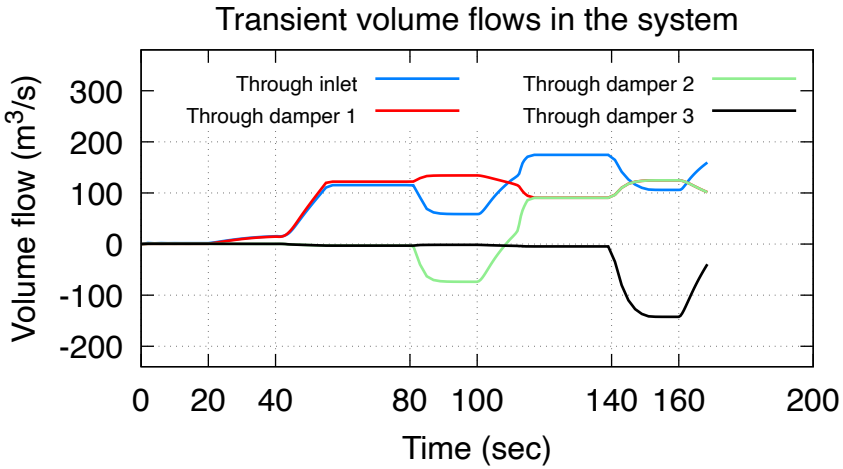

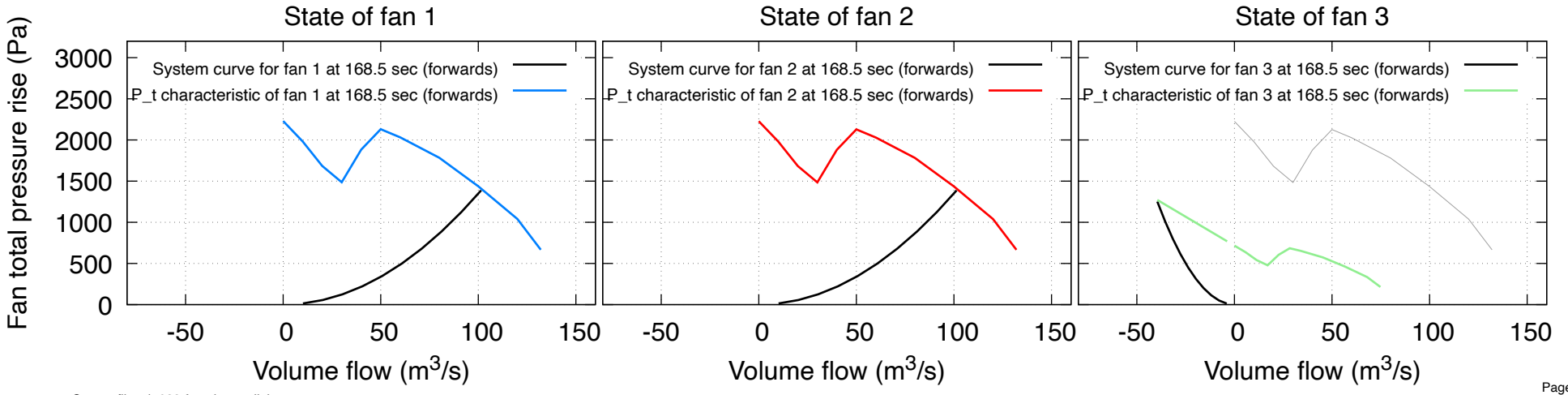

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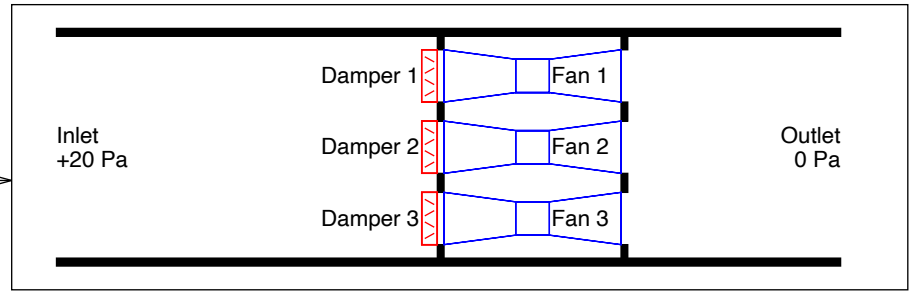

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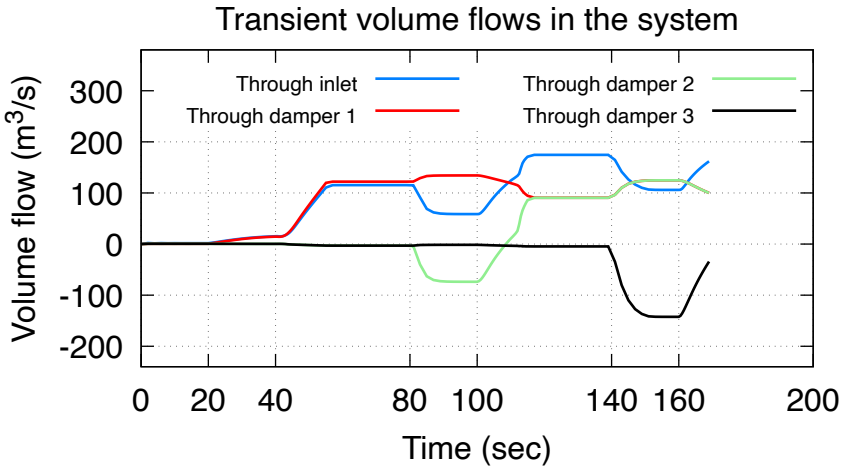

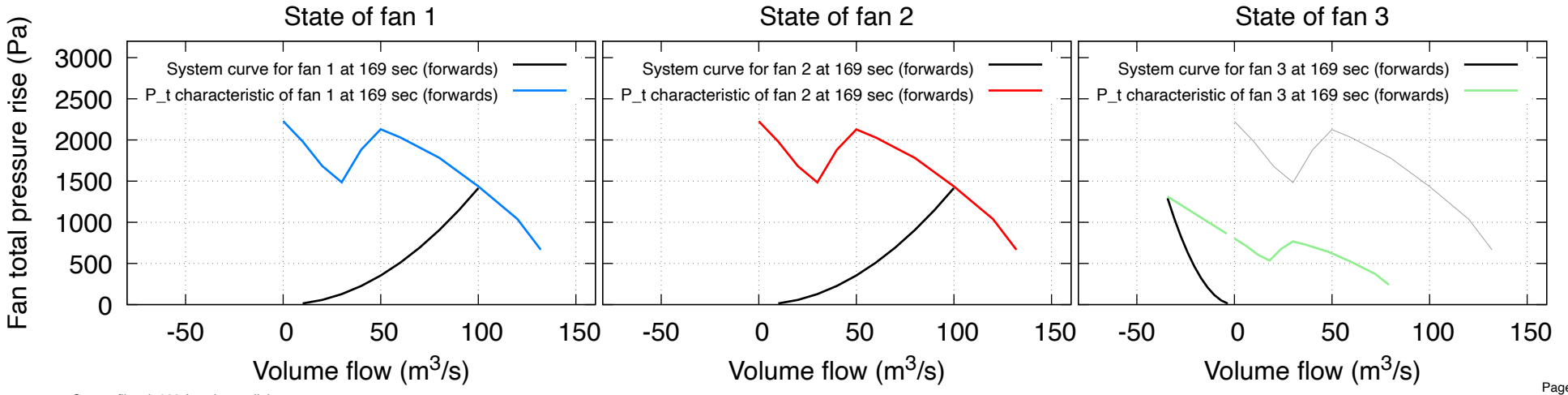

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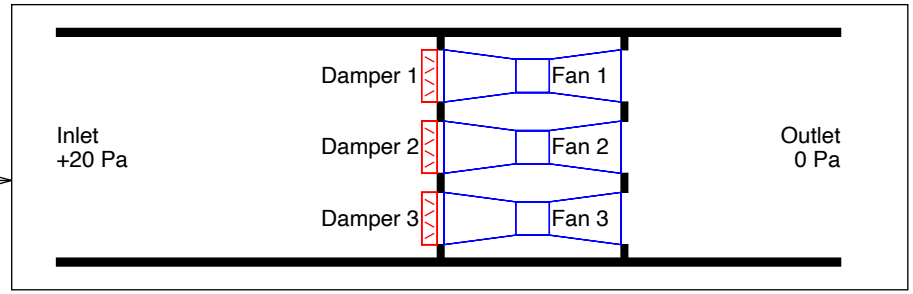

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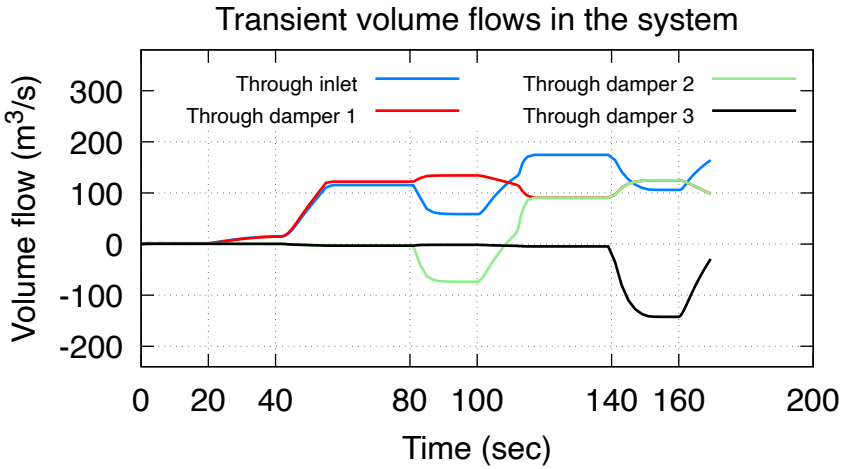

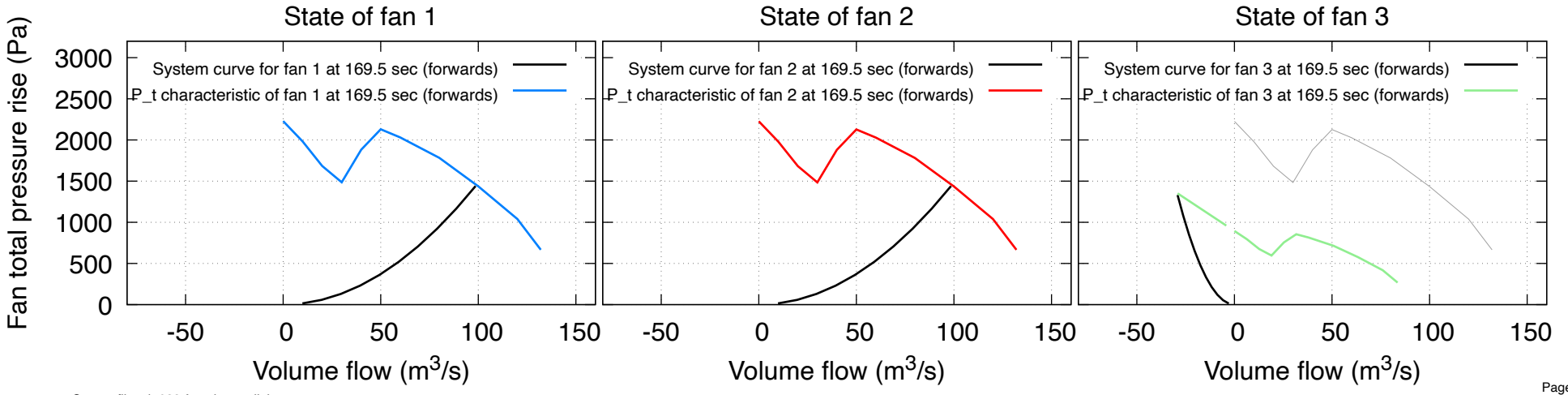

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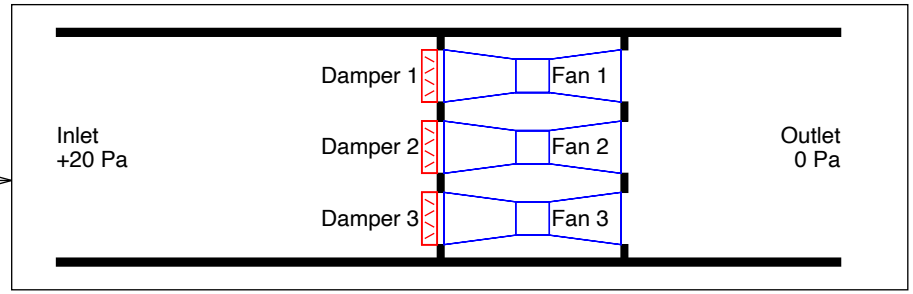

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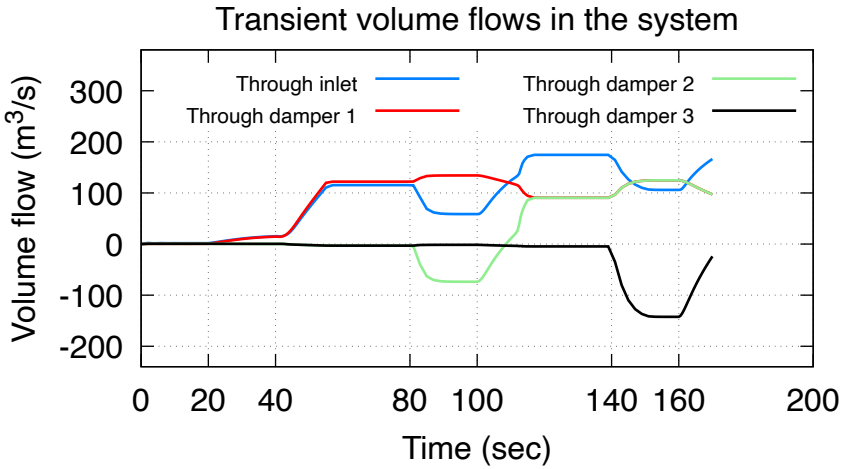

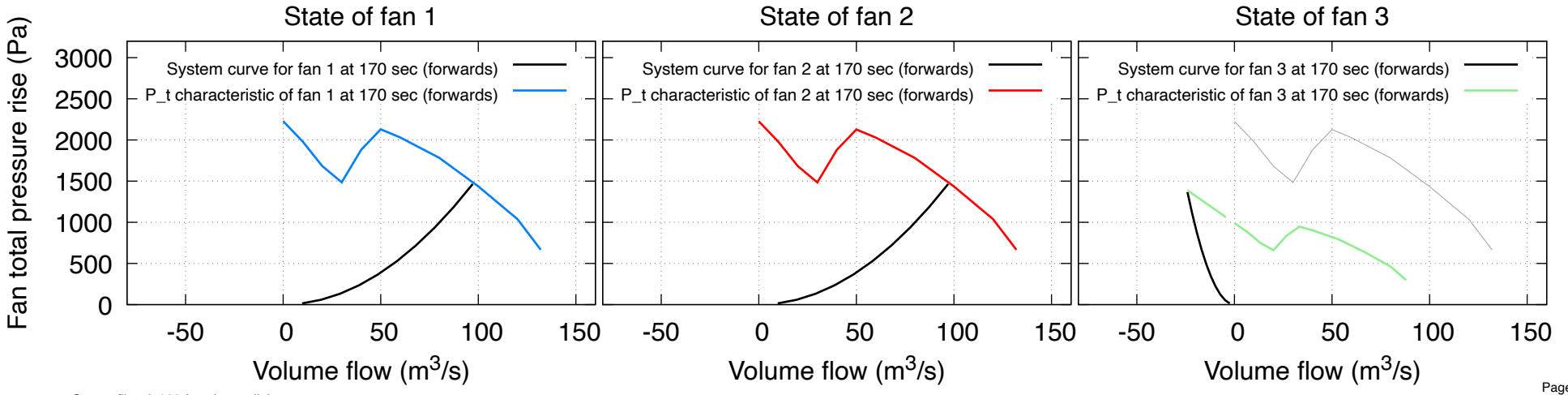

Source file: ok-032-fans-in-parallel.txt.

Created by Hobyah.py from ok-032-fans-in-parallel.txt, 16:50 on 14 Jul 2023 by tester

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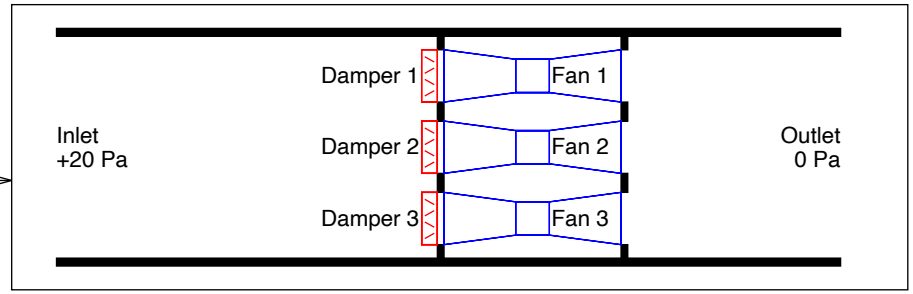

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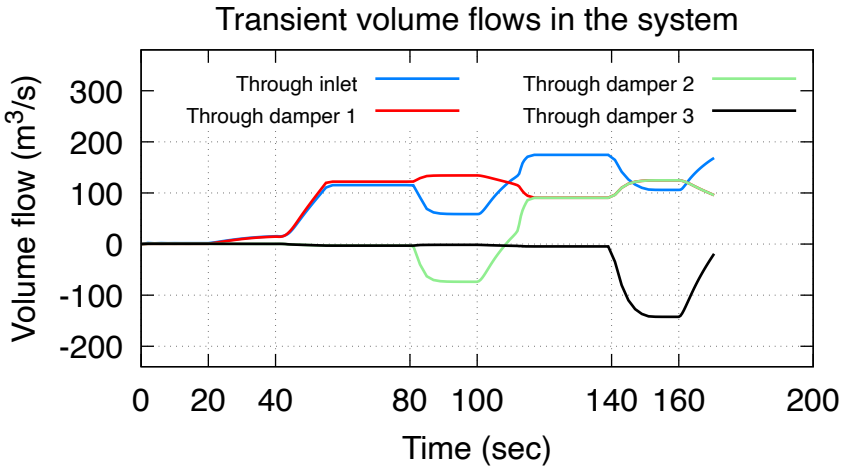

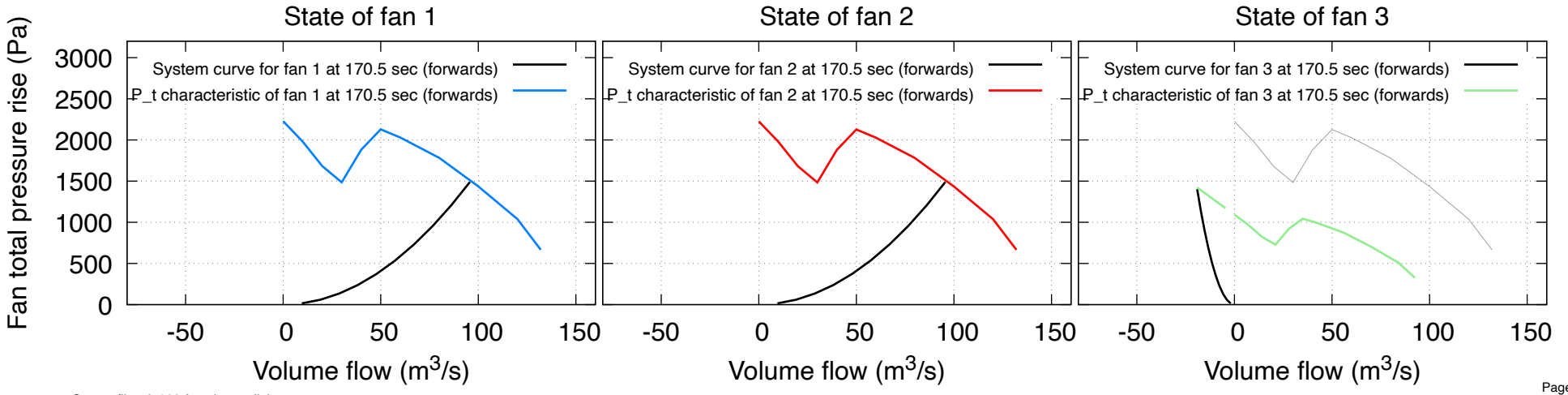

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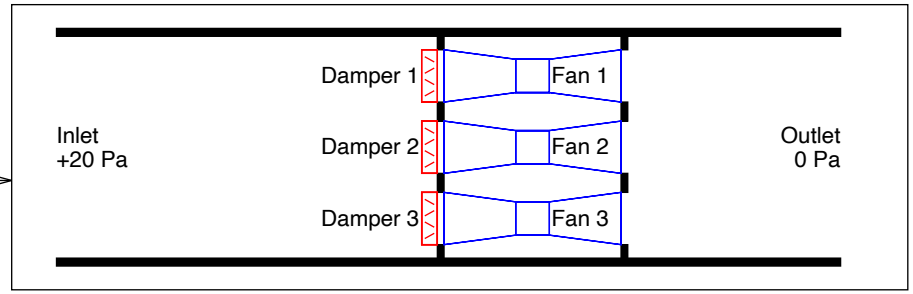

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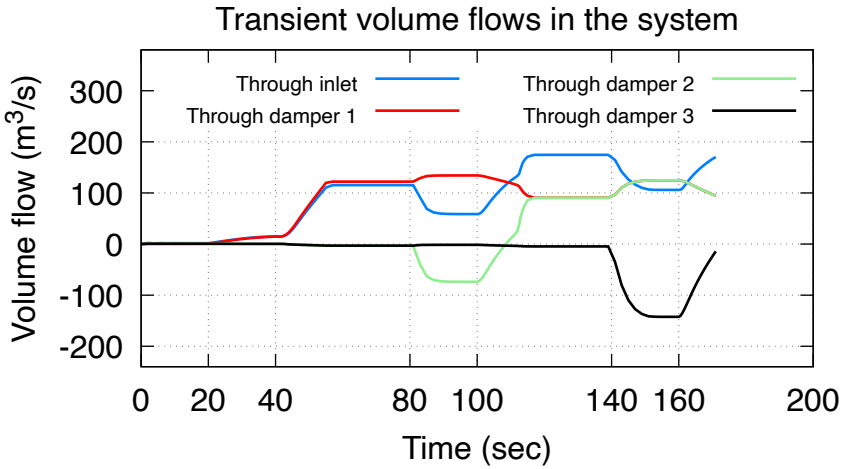

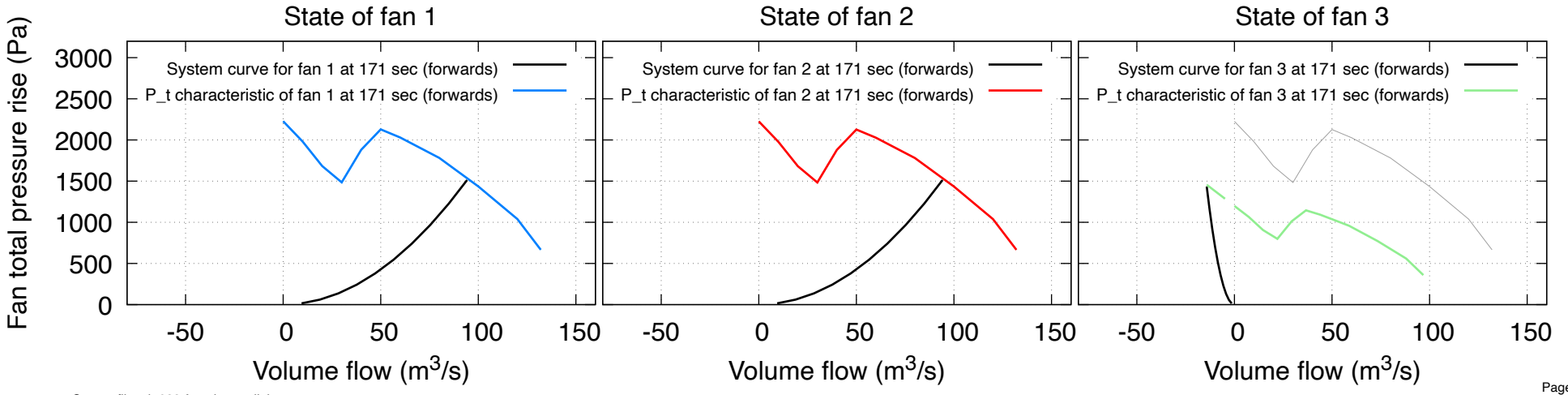

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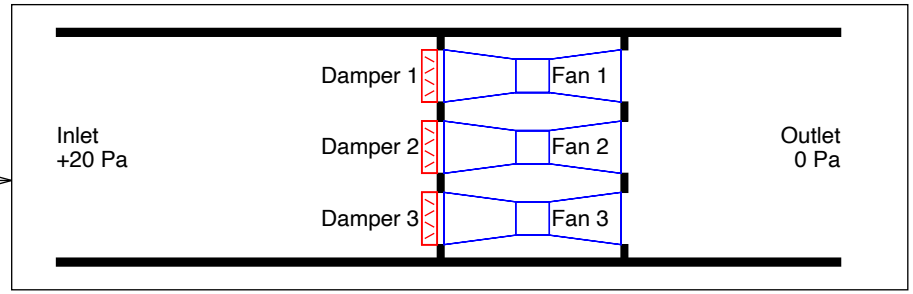

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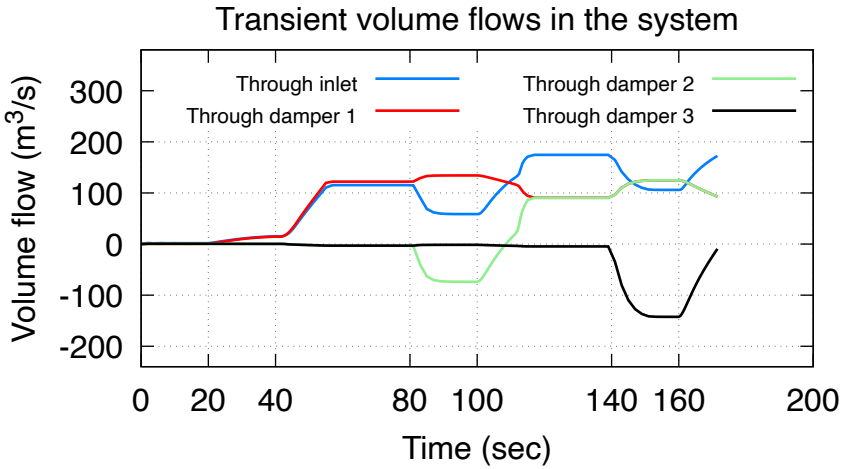

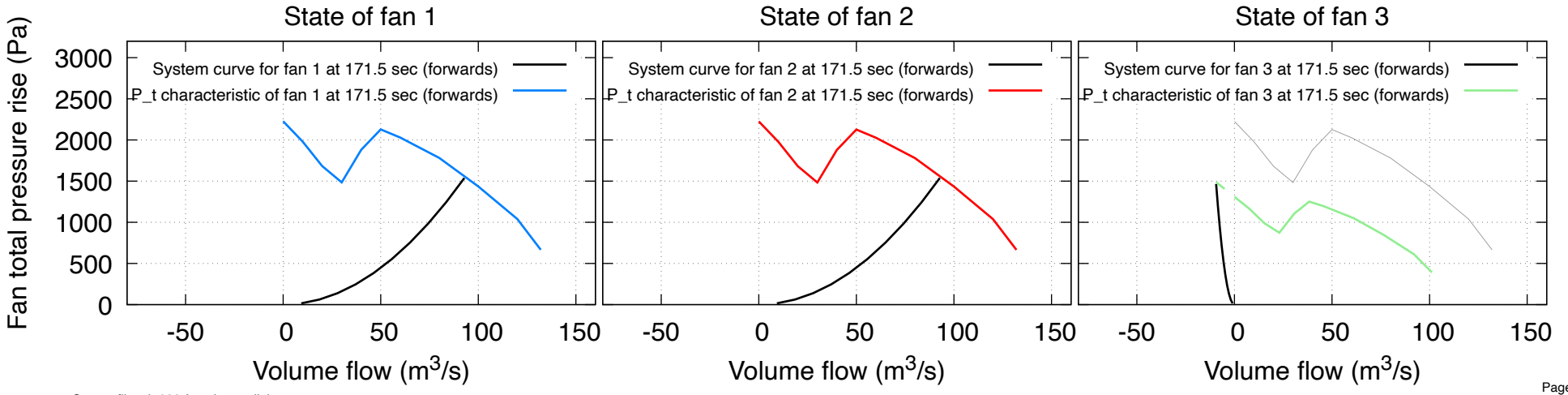

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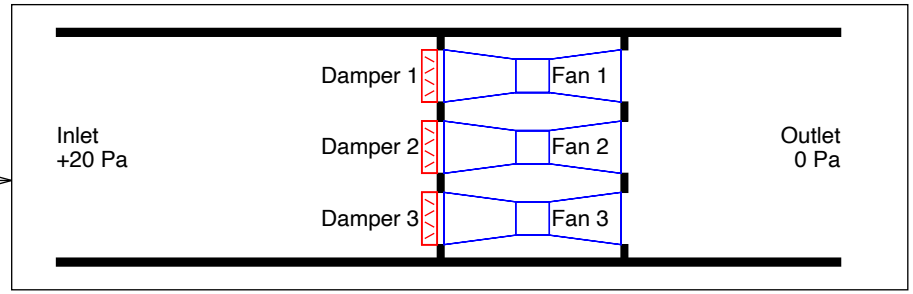

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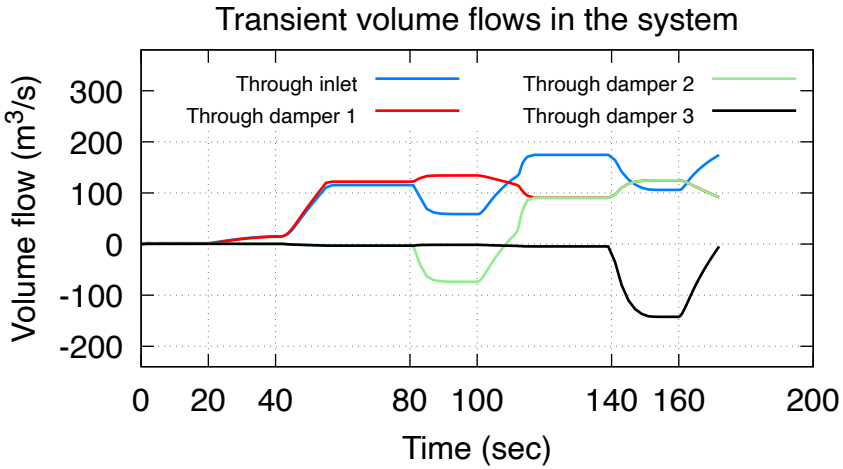

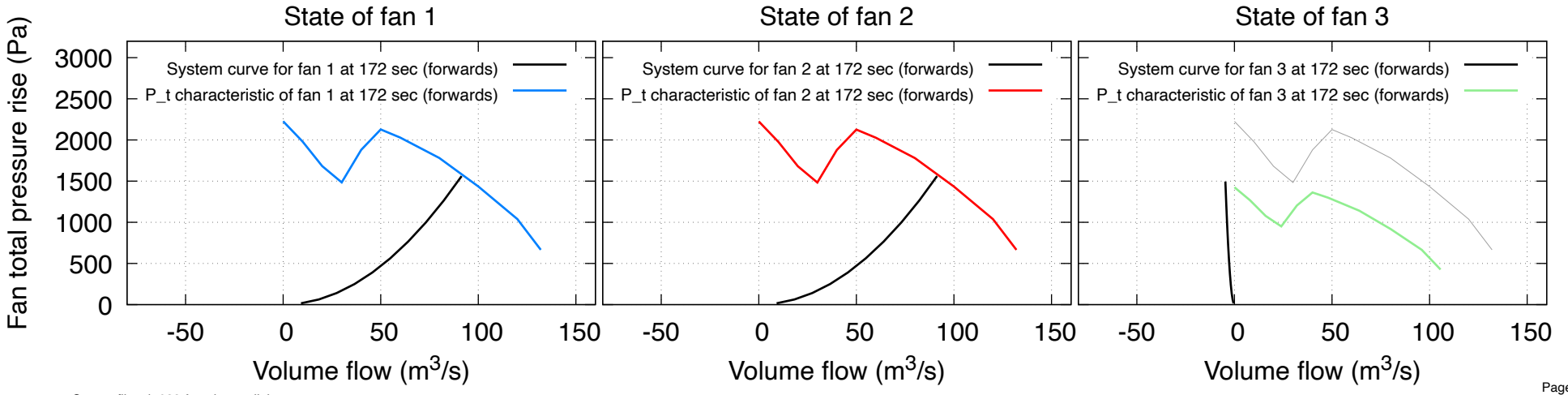

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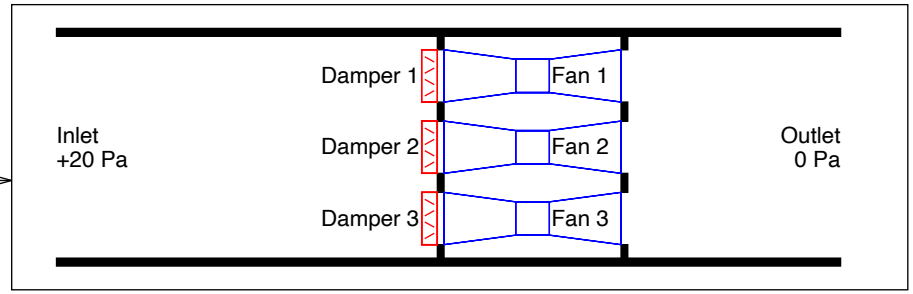

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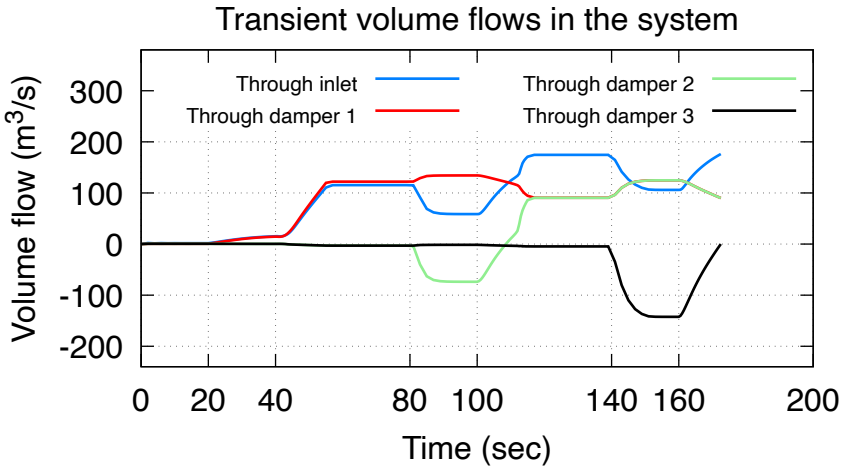

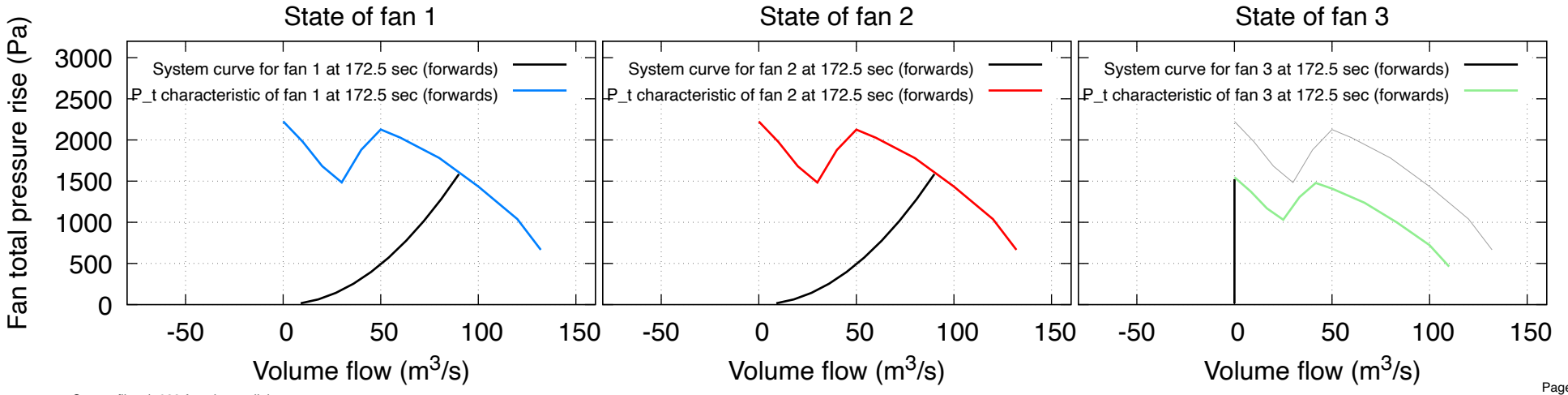

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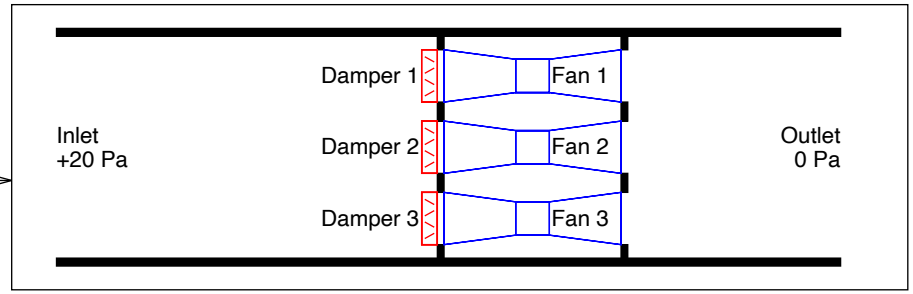

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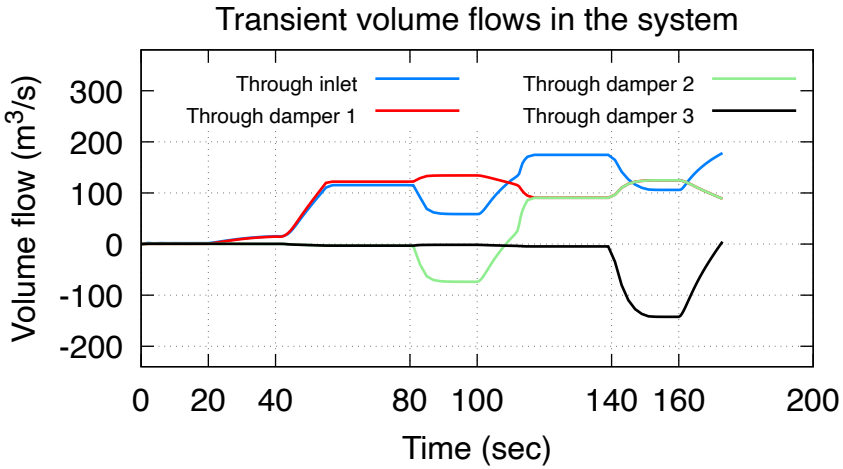

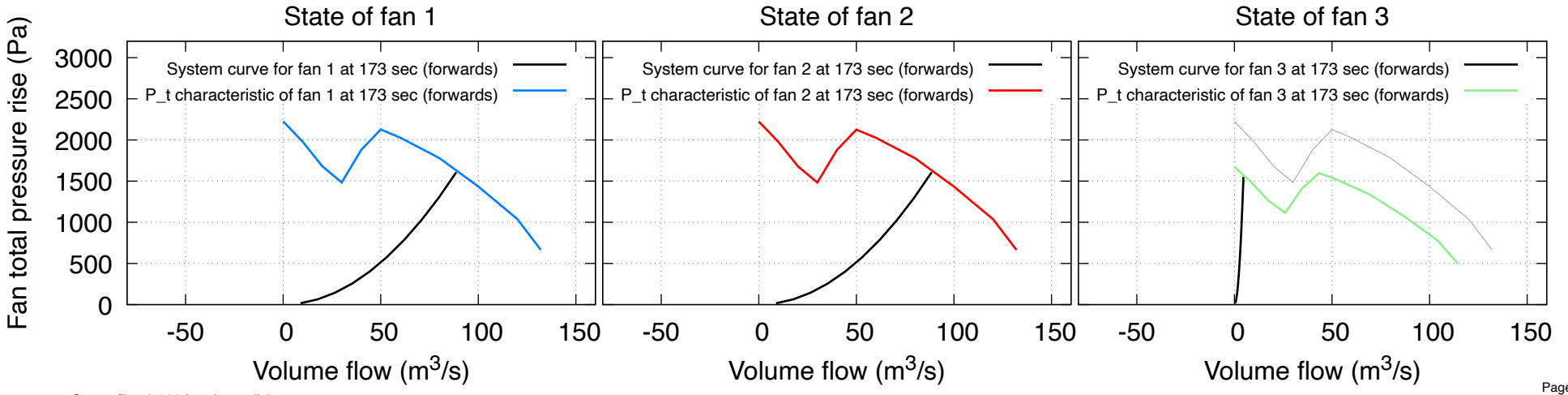

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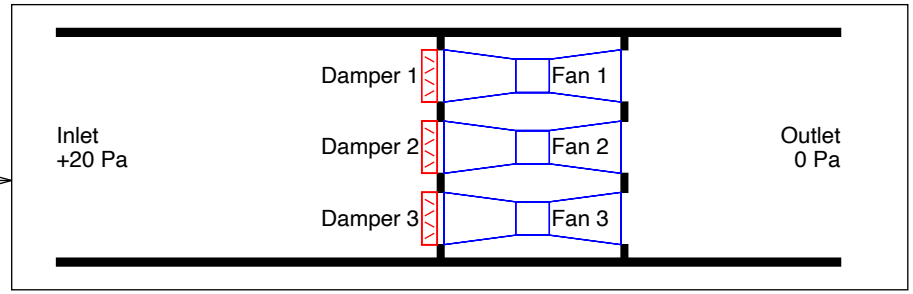

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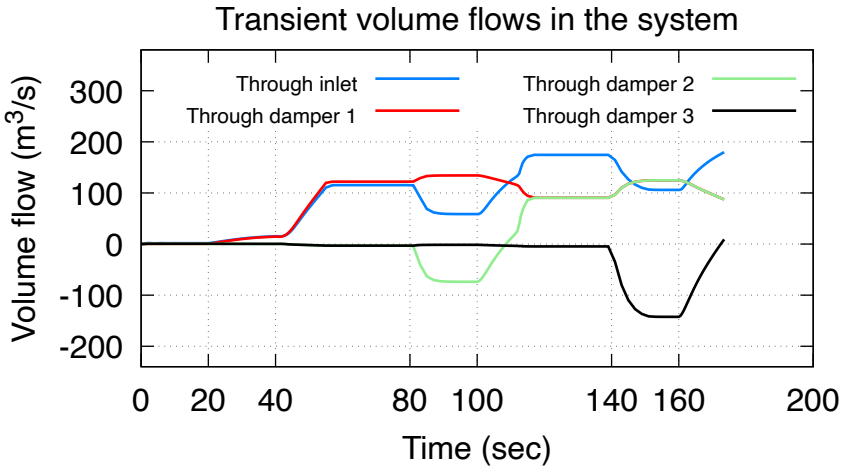

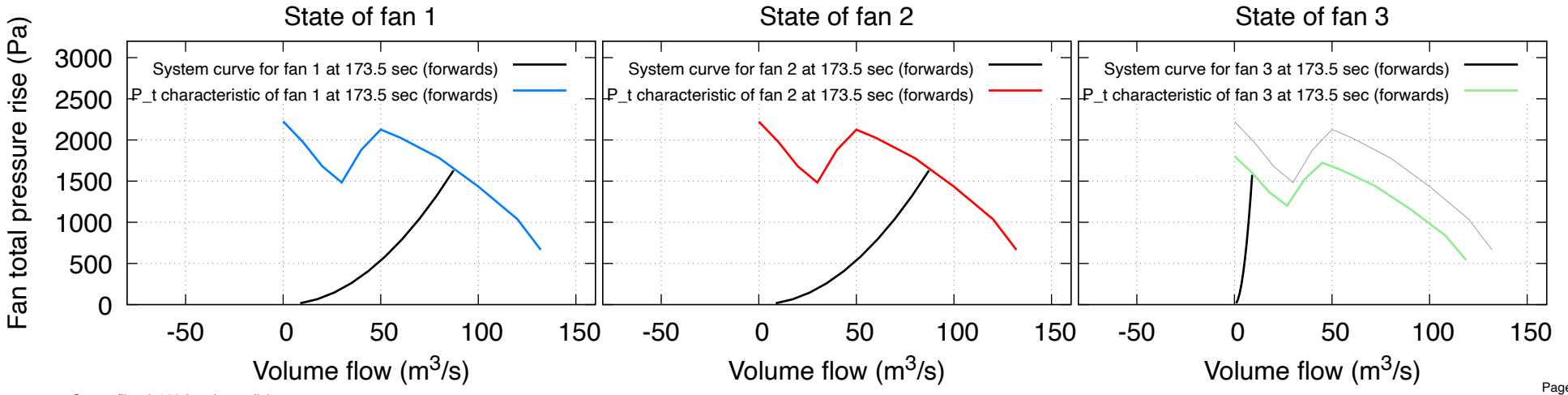

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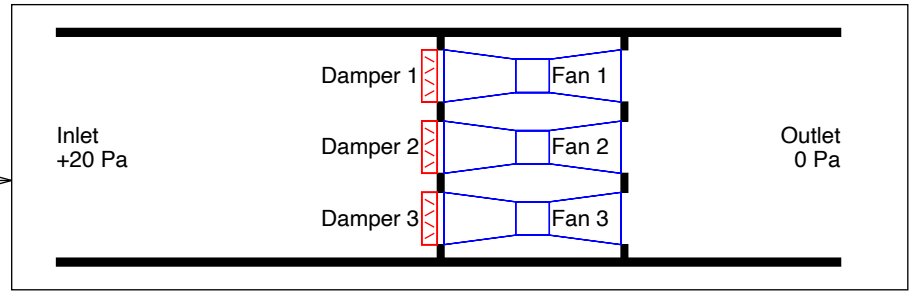

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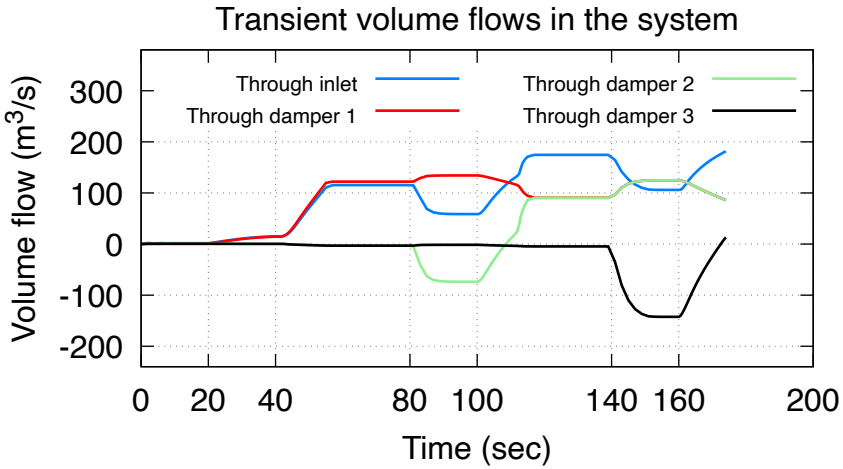

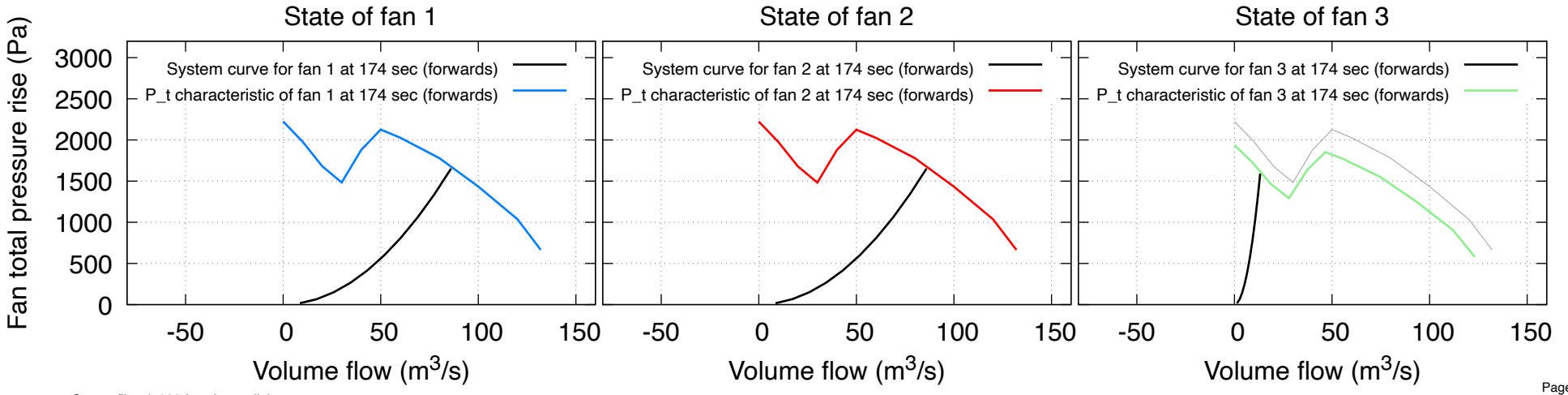

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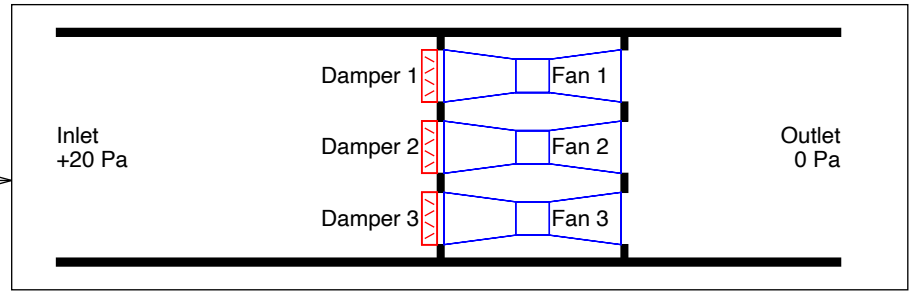

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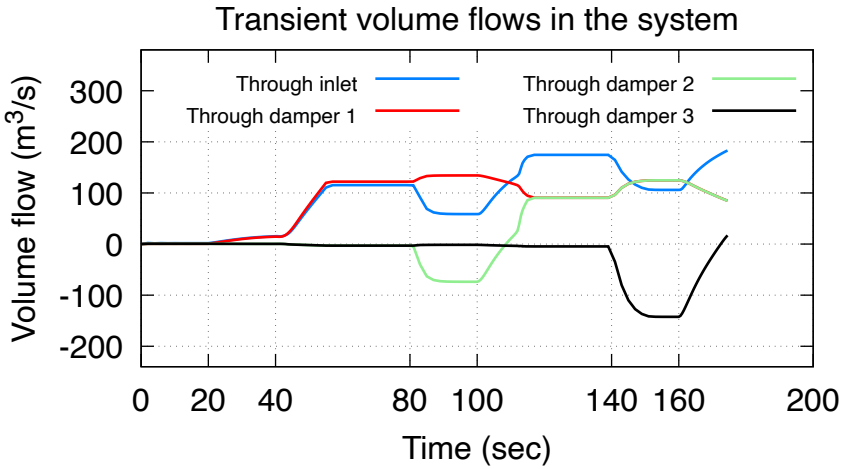

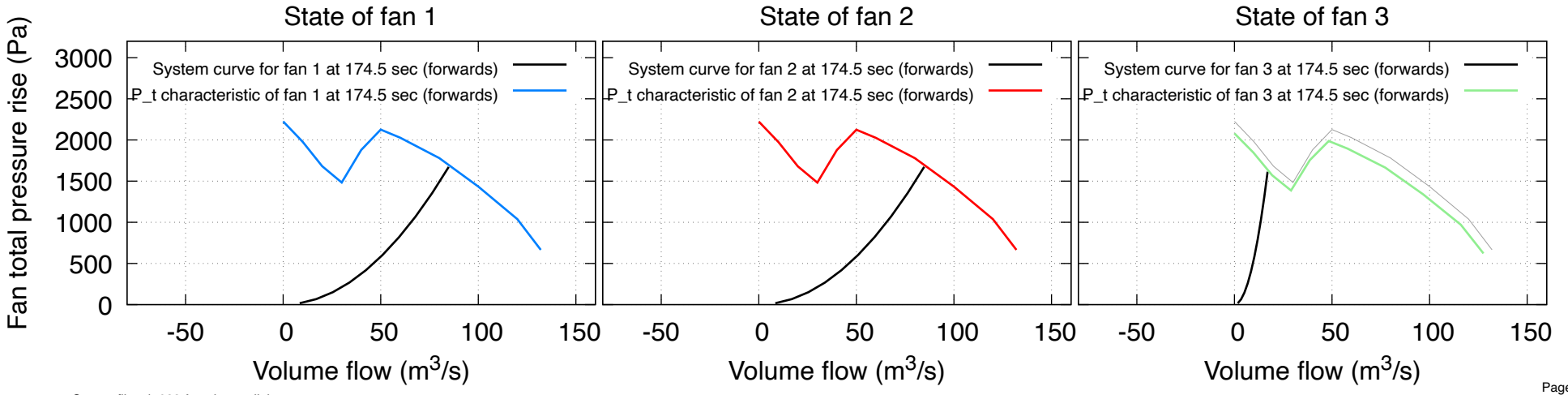

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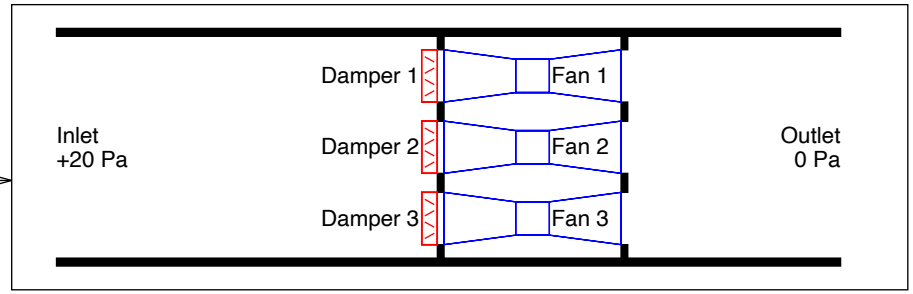

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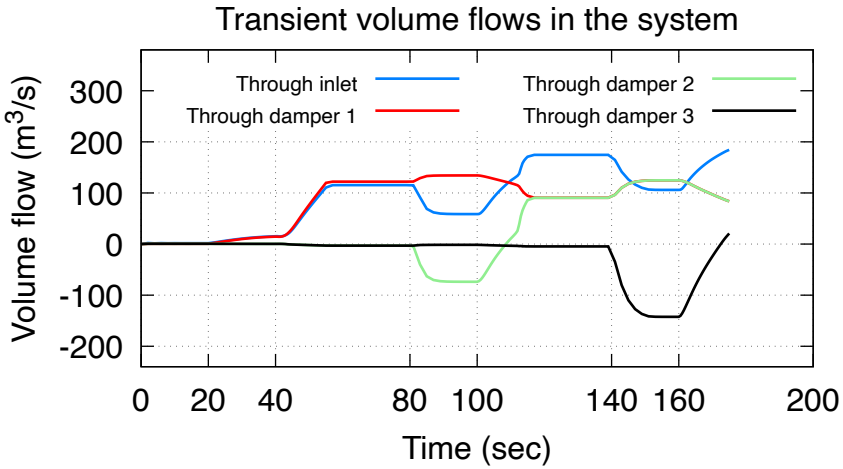

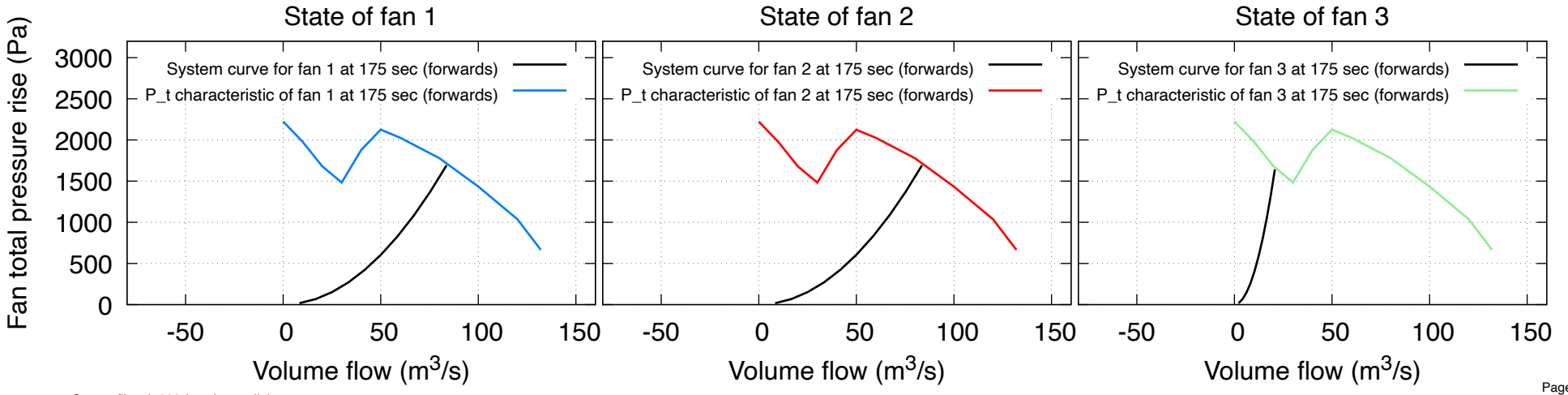

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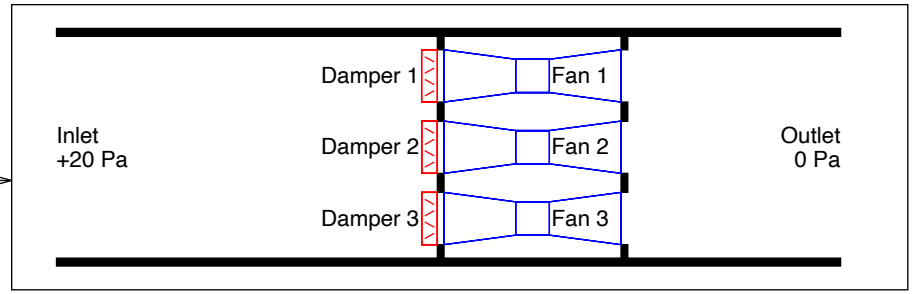

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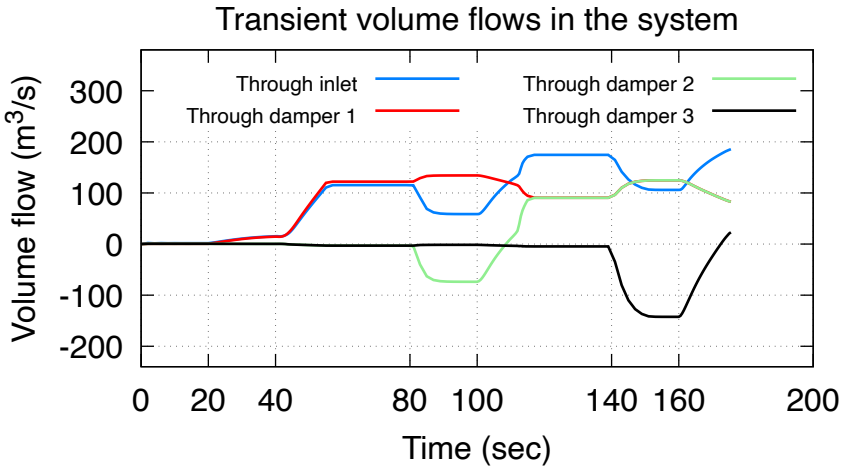

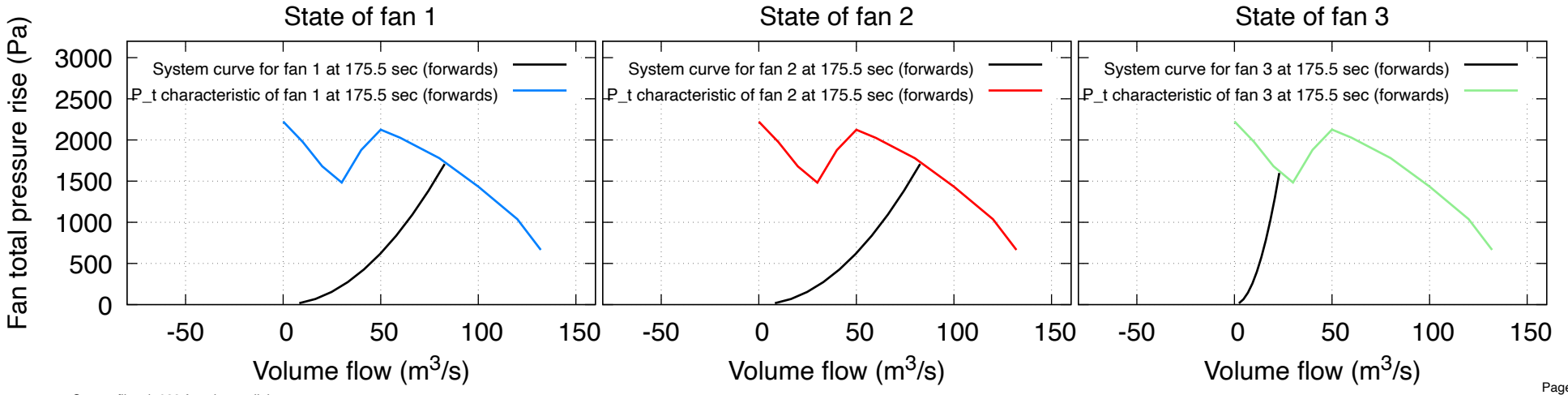

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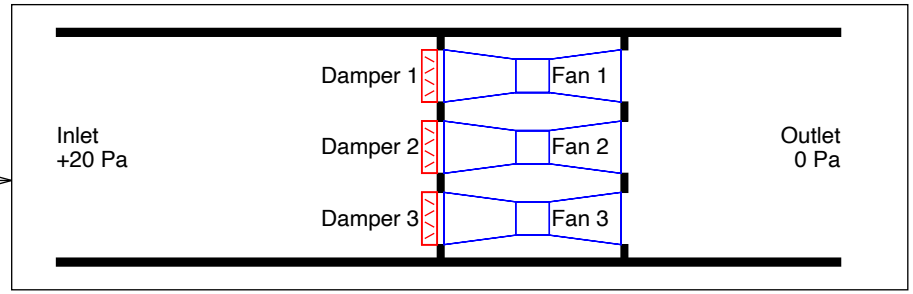

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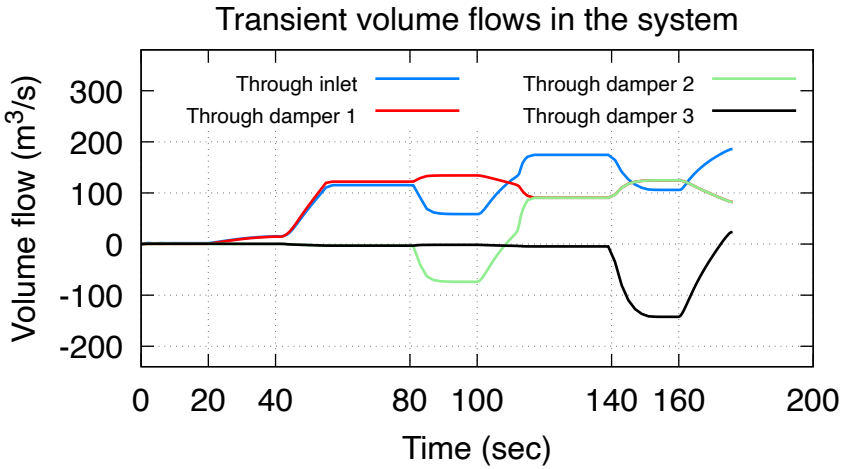

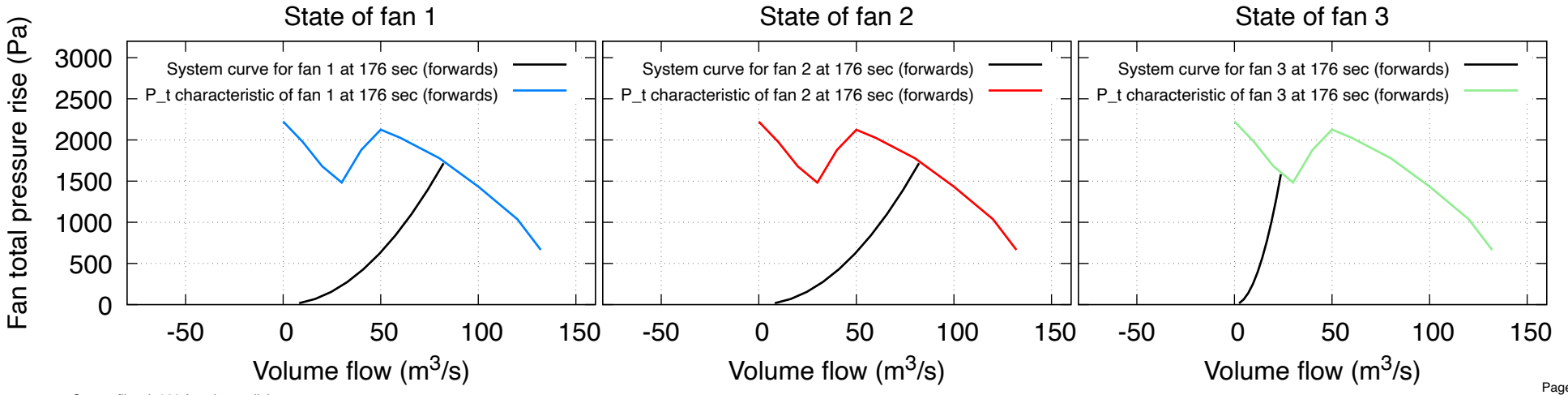

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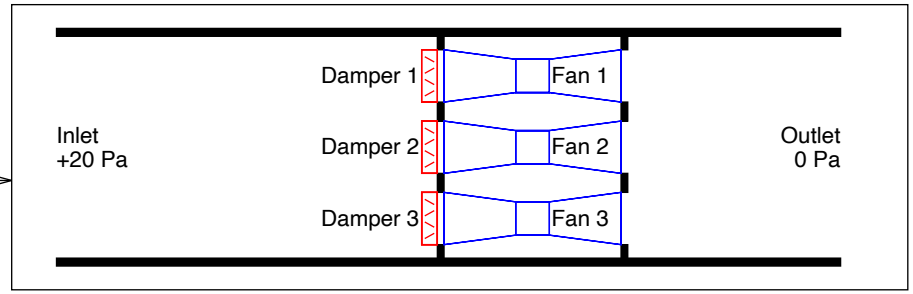

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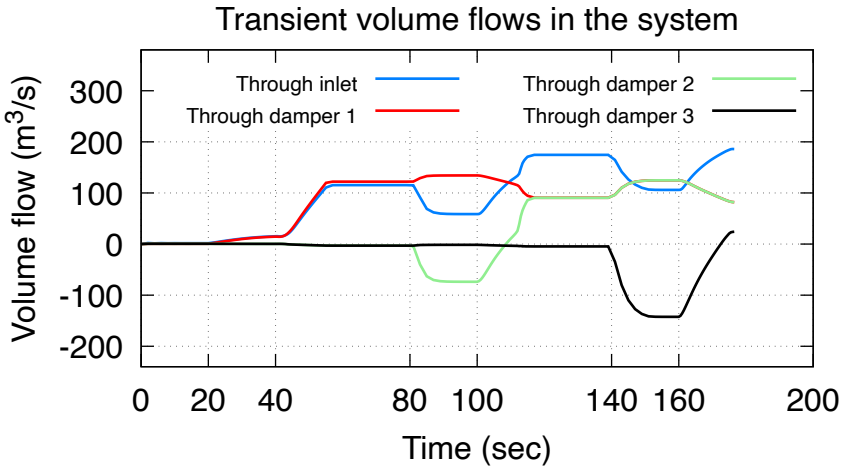

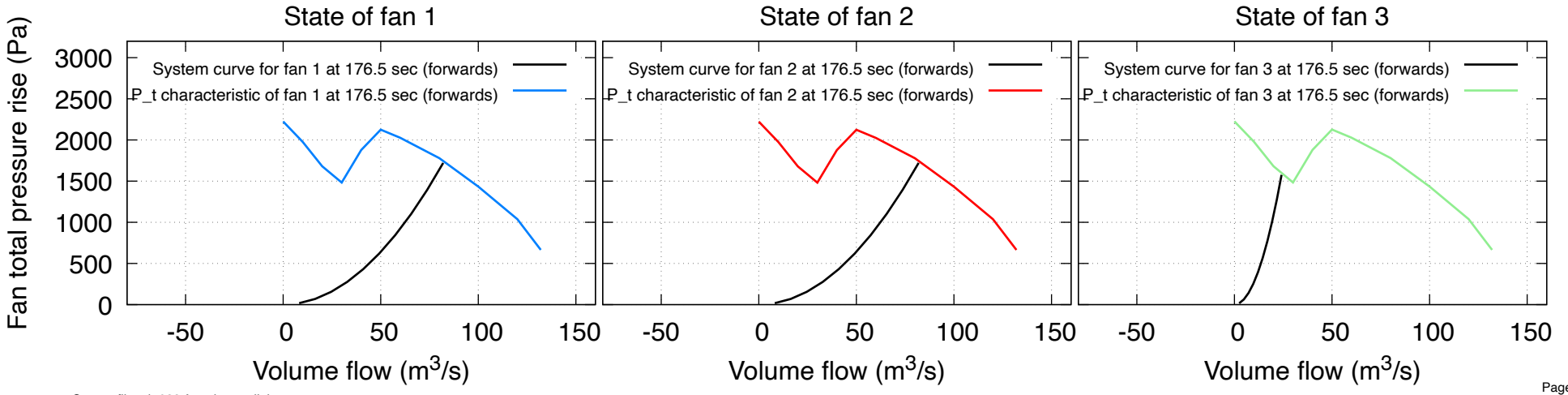

Source file: ok-032-fans-in-parallel.txt.

Created by Hobyah.py from ok-032-fans-in-parallel.txt, 16:50 on 14 Jul 2023 by tester

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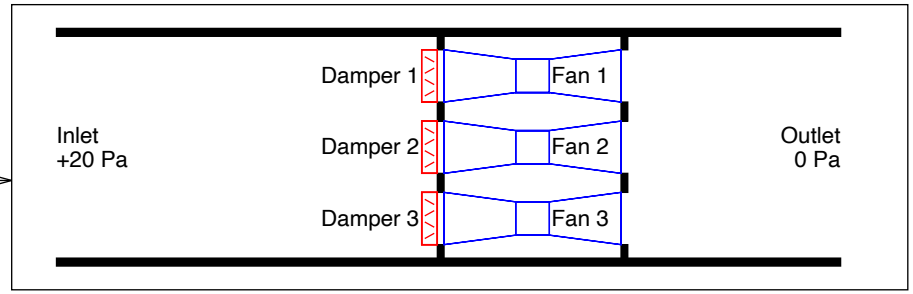

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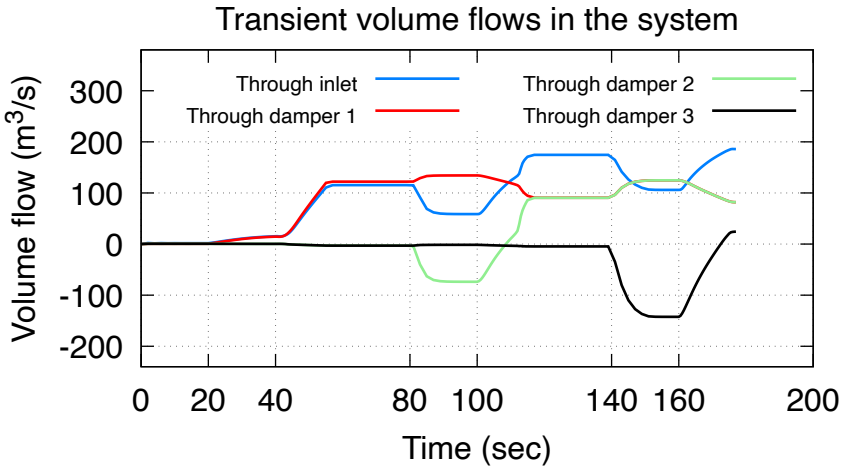

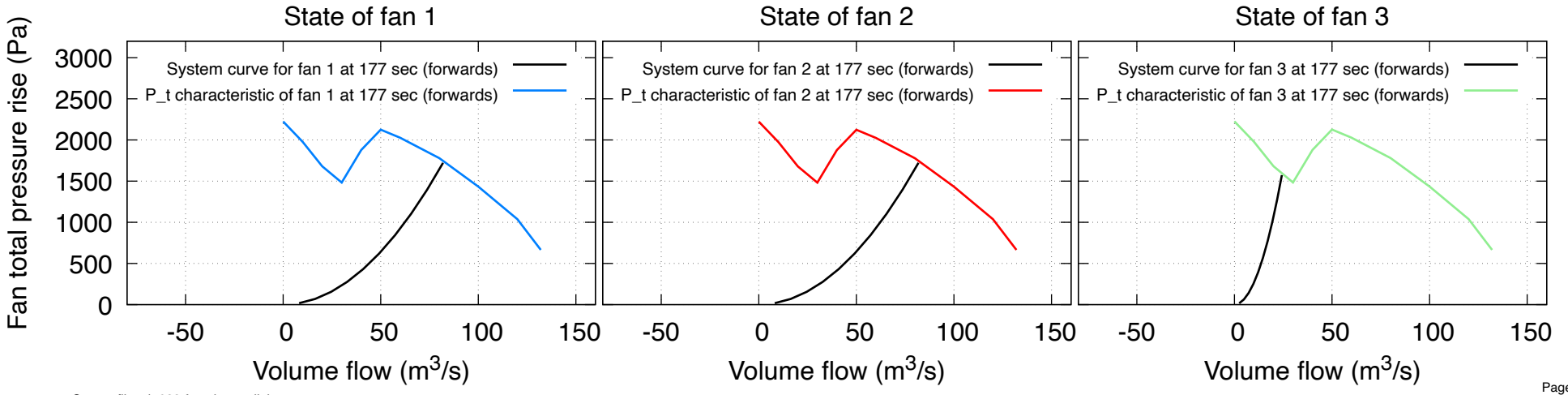

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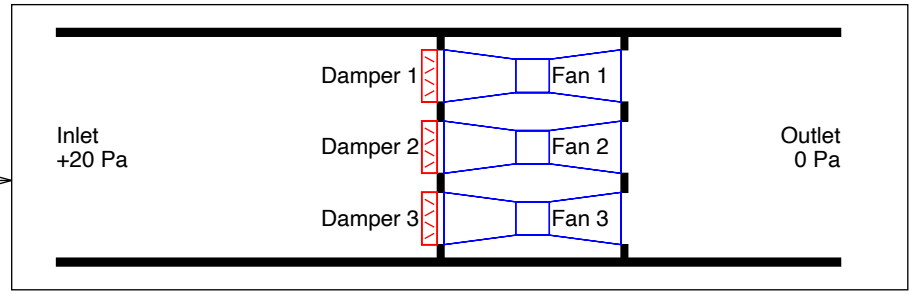

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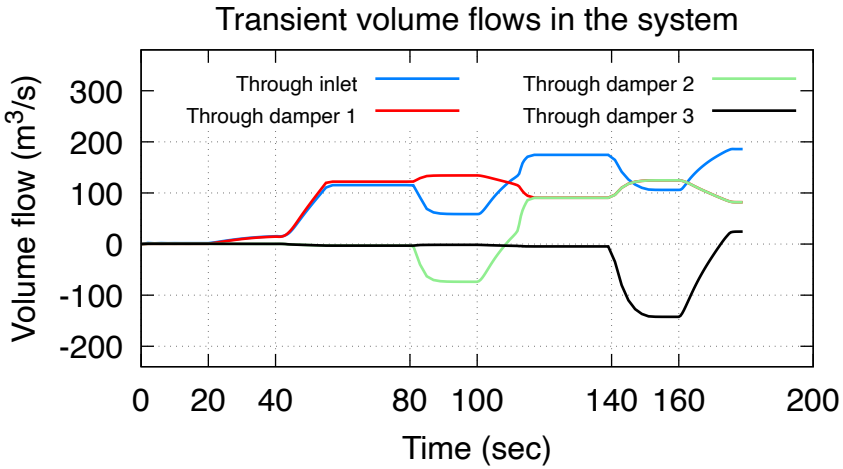

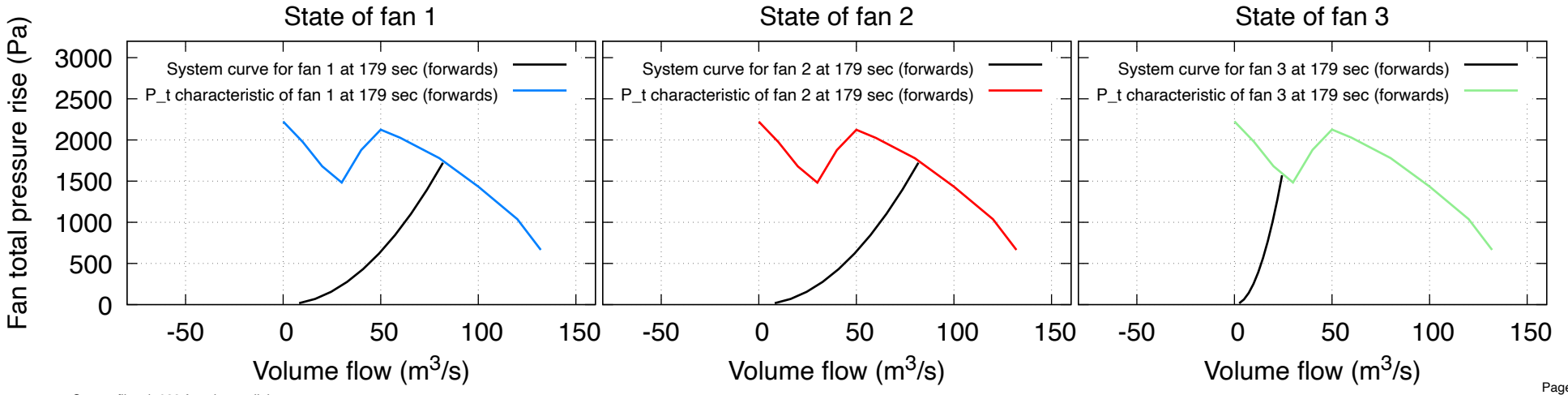

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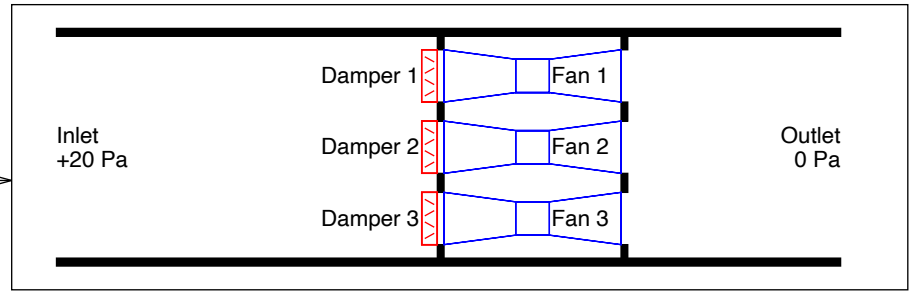

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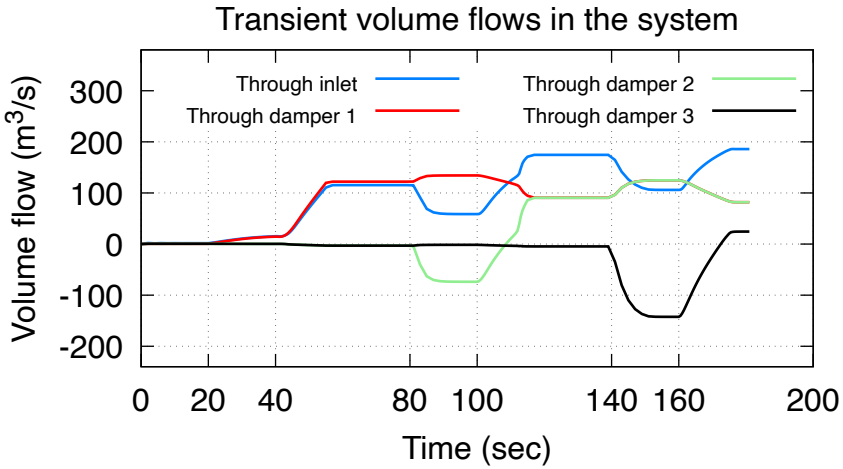

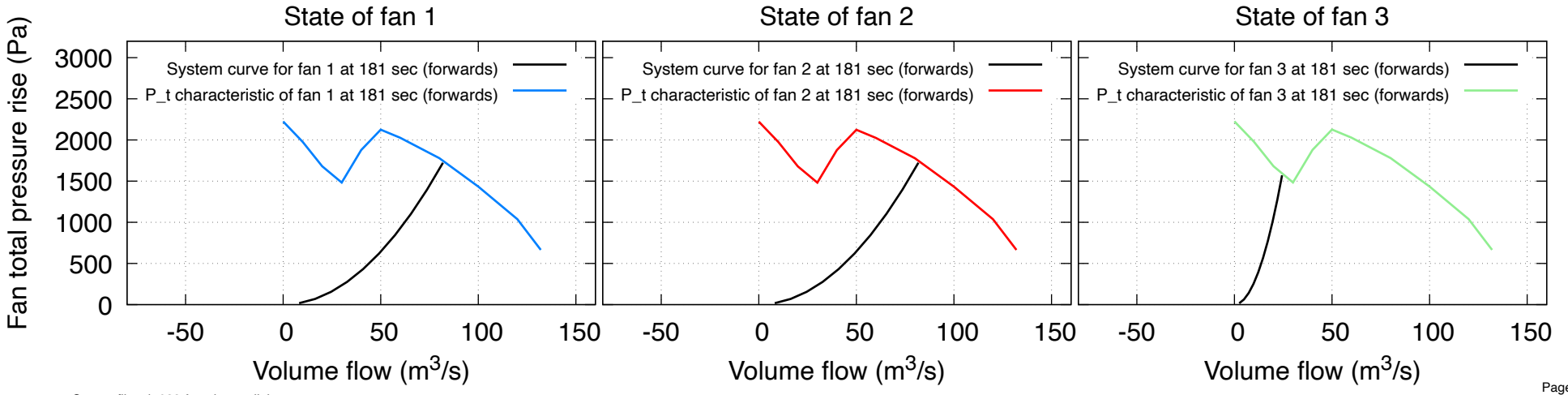

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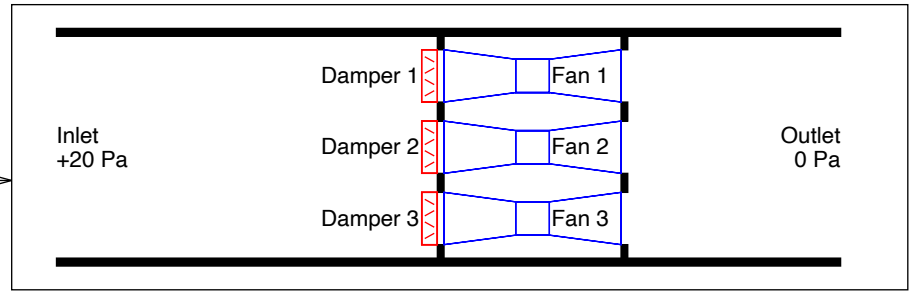

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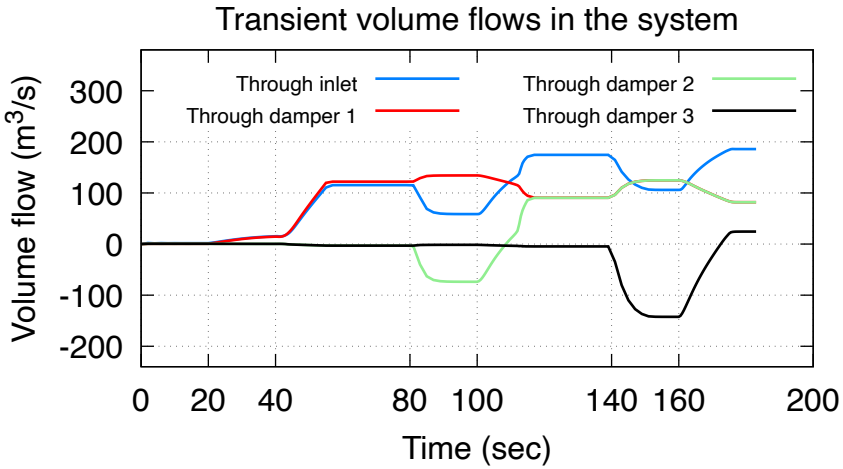

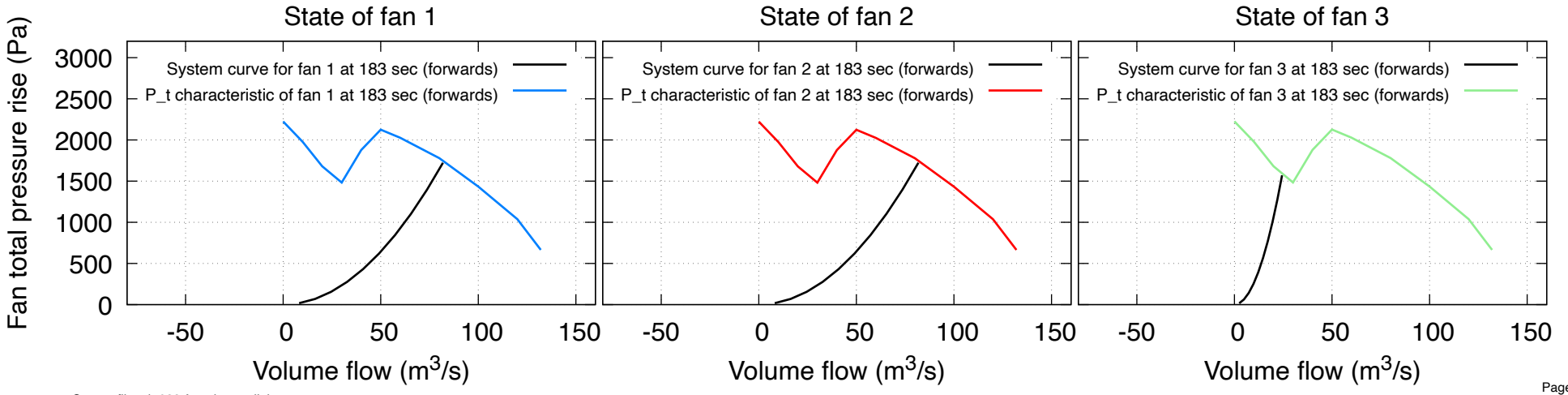

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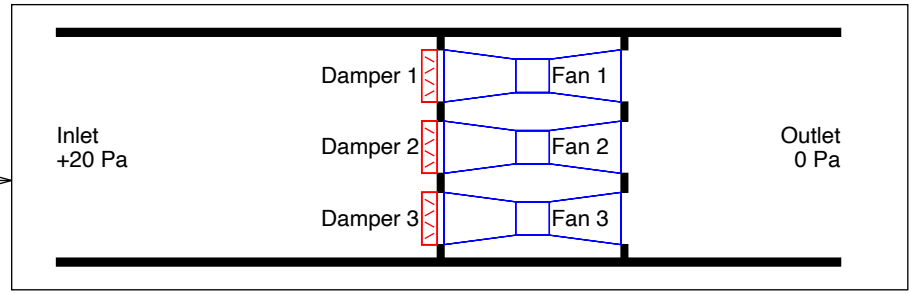

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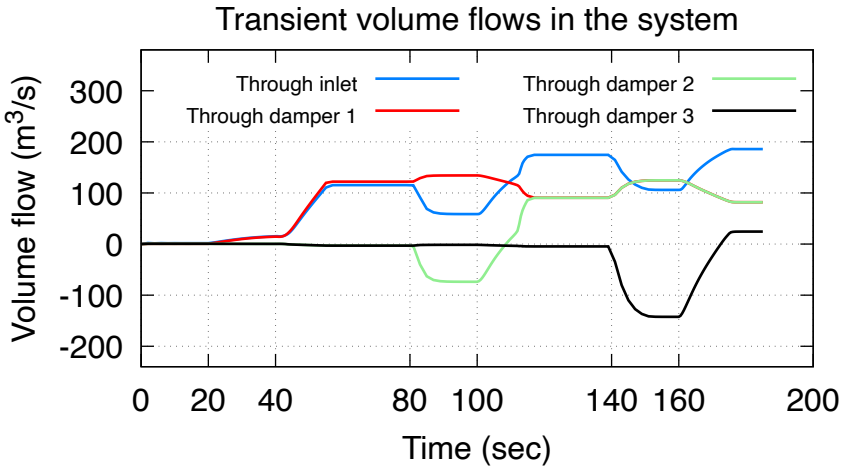

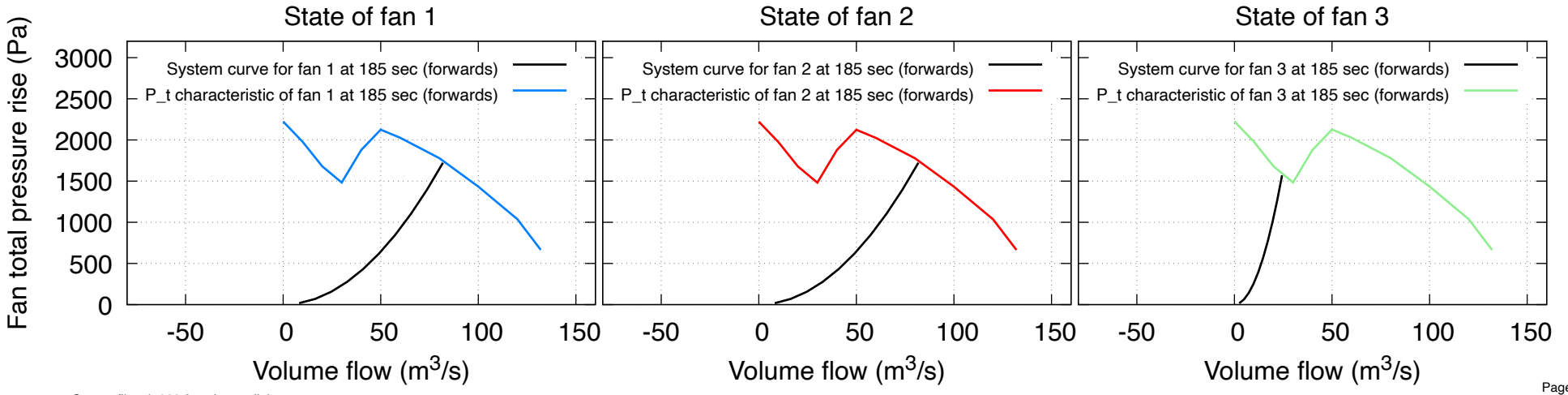

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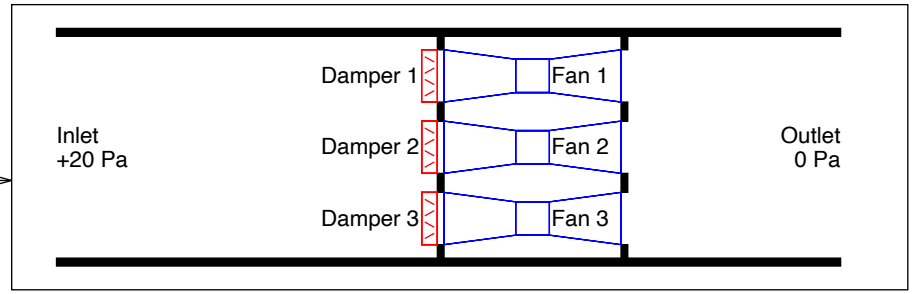

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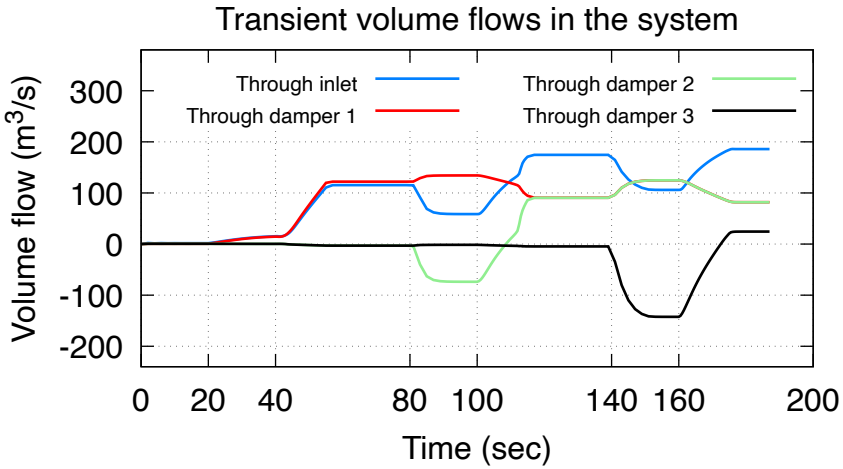

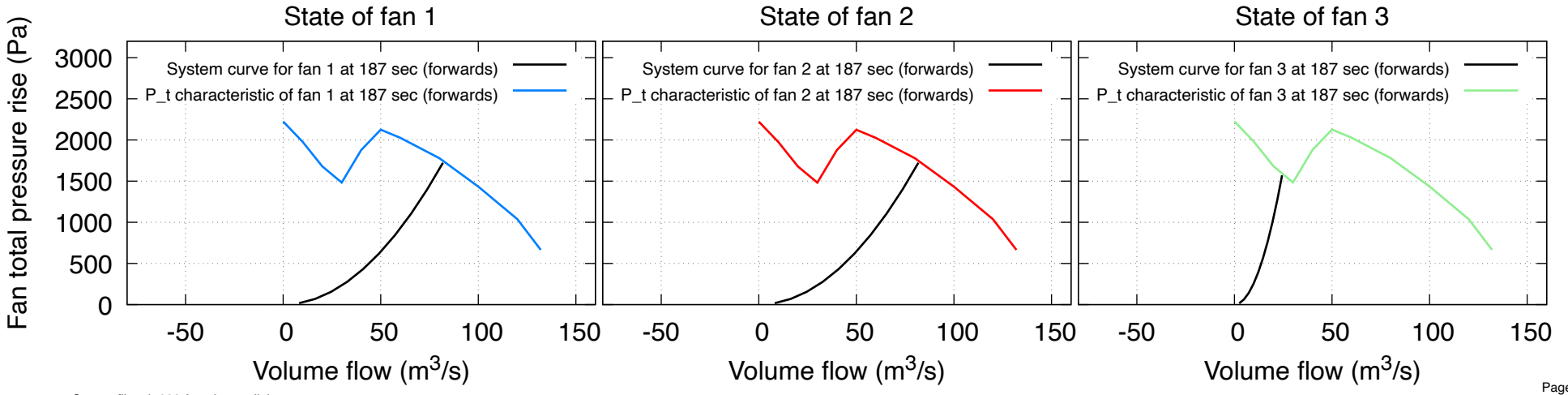

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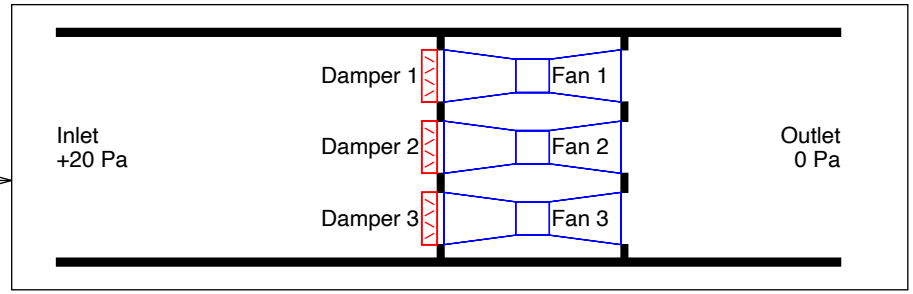

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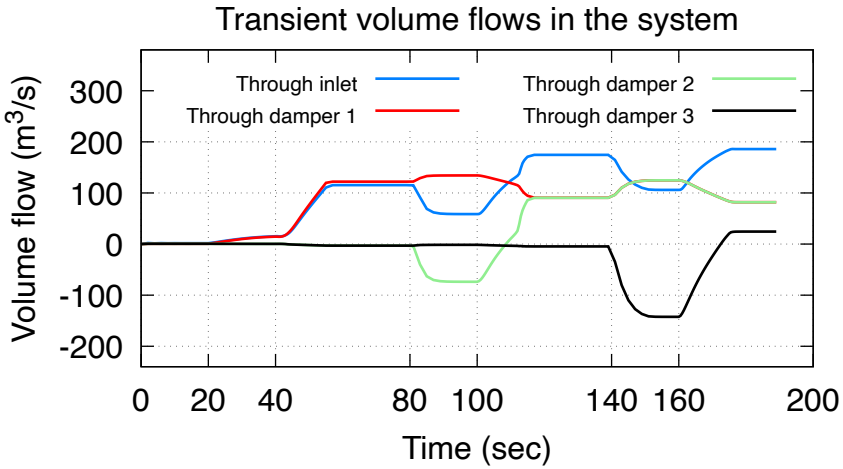

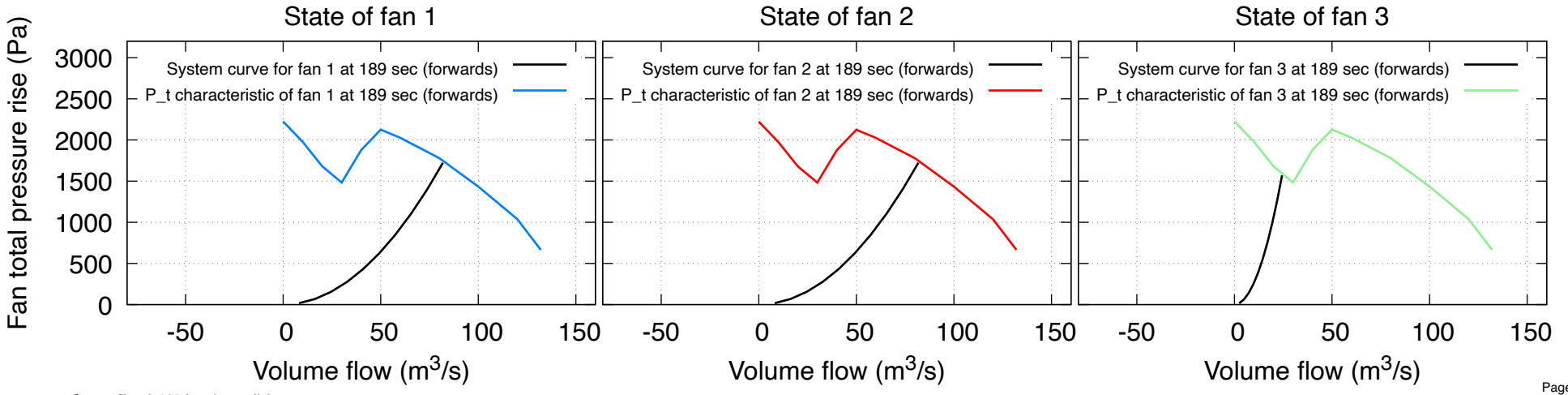

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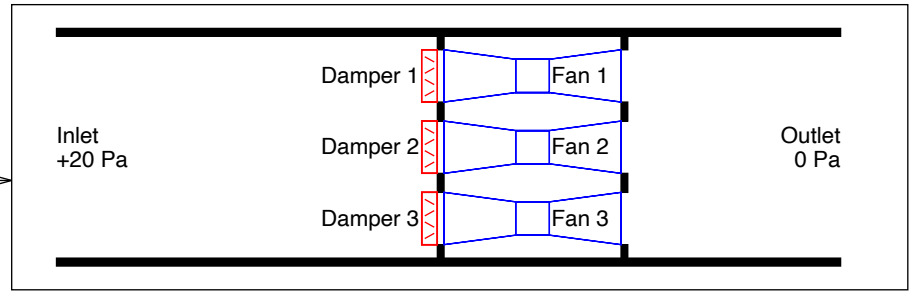

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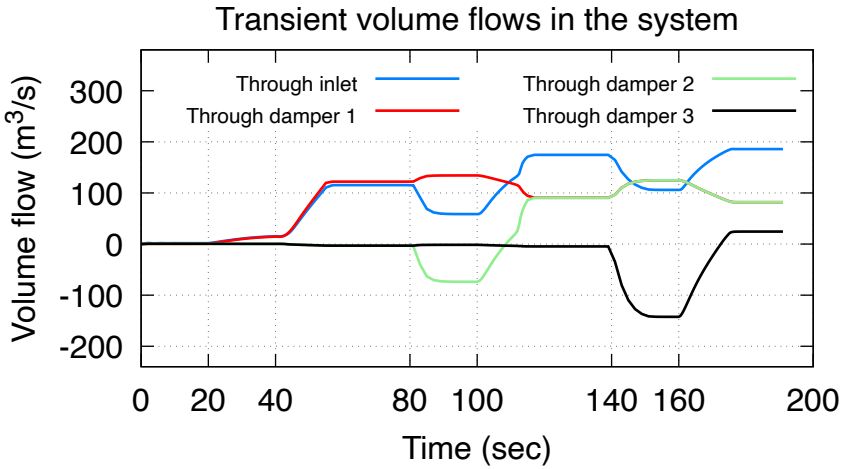

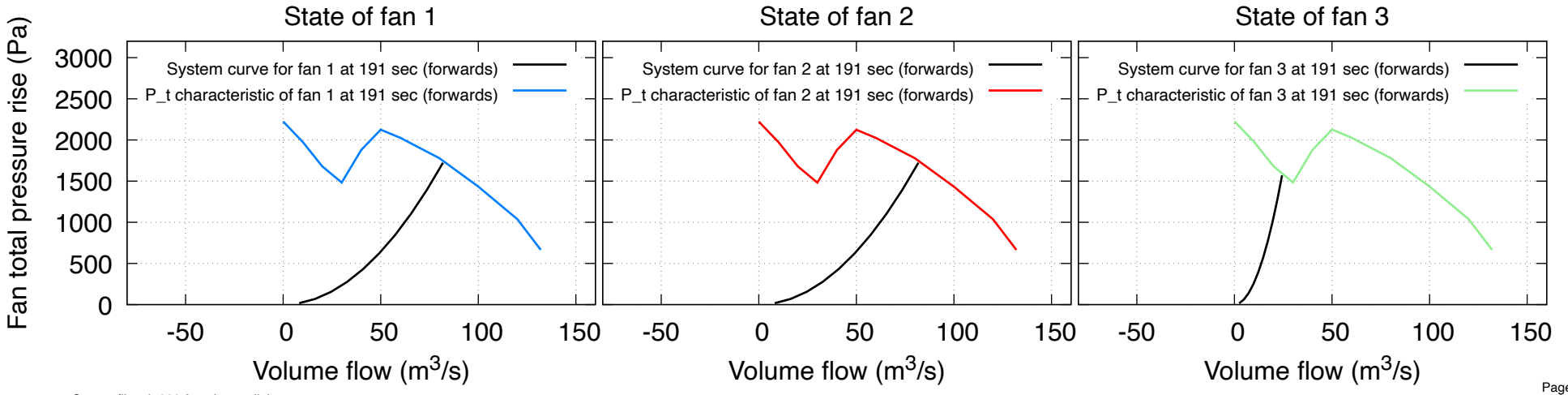

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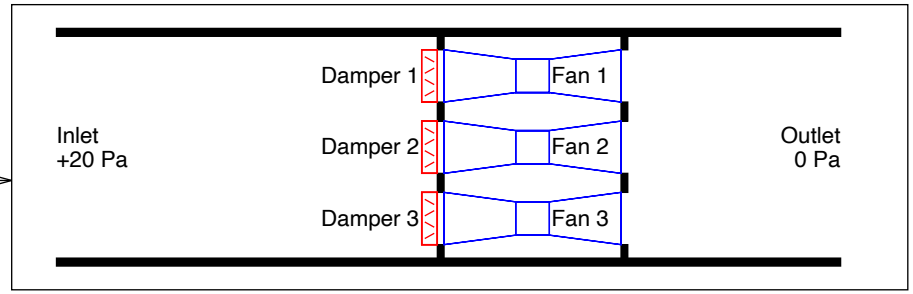

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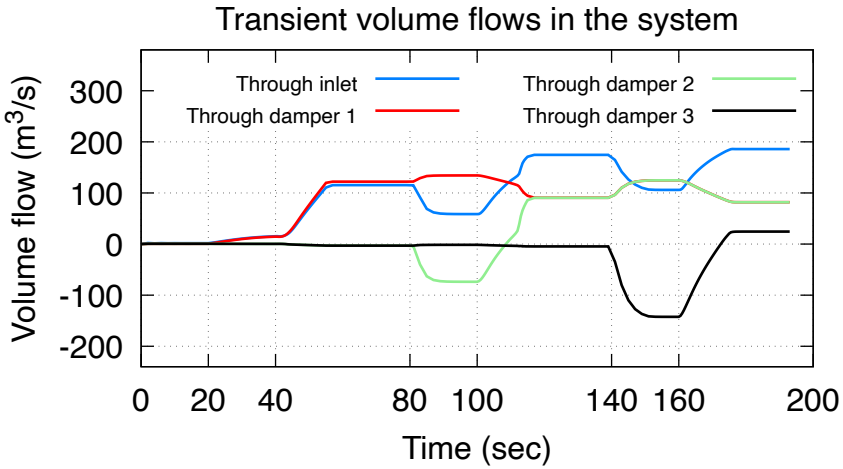

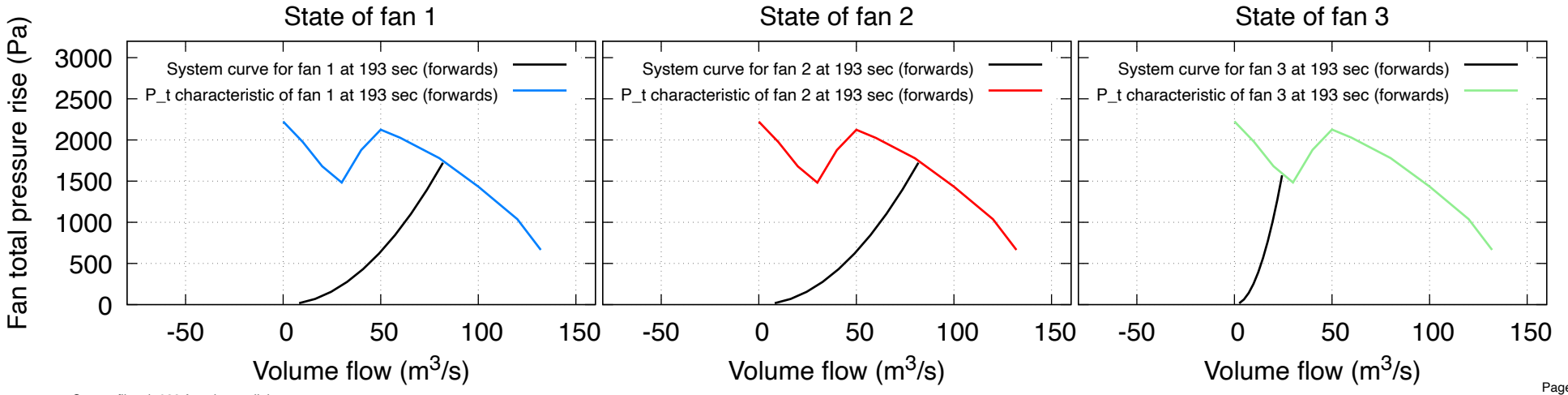

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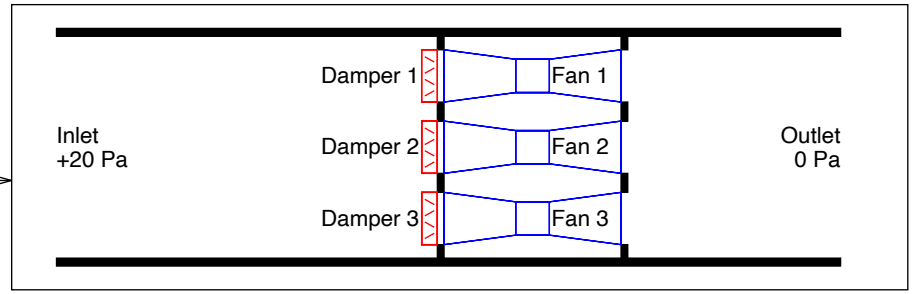

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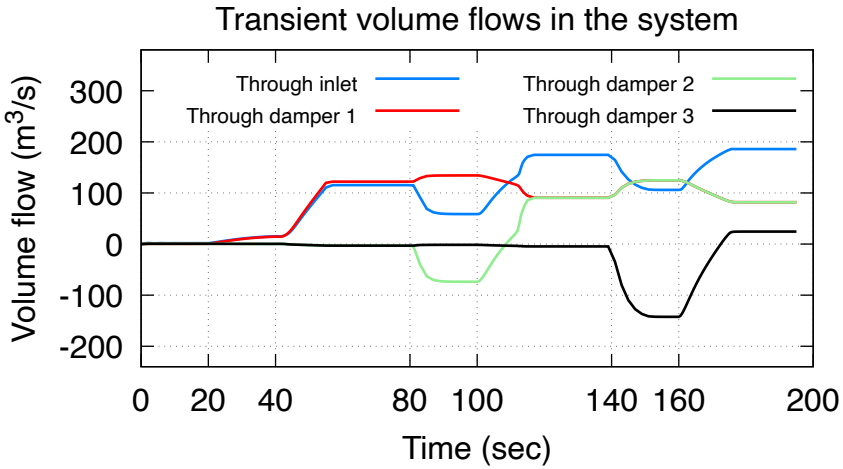

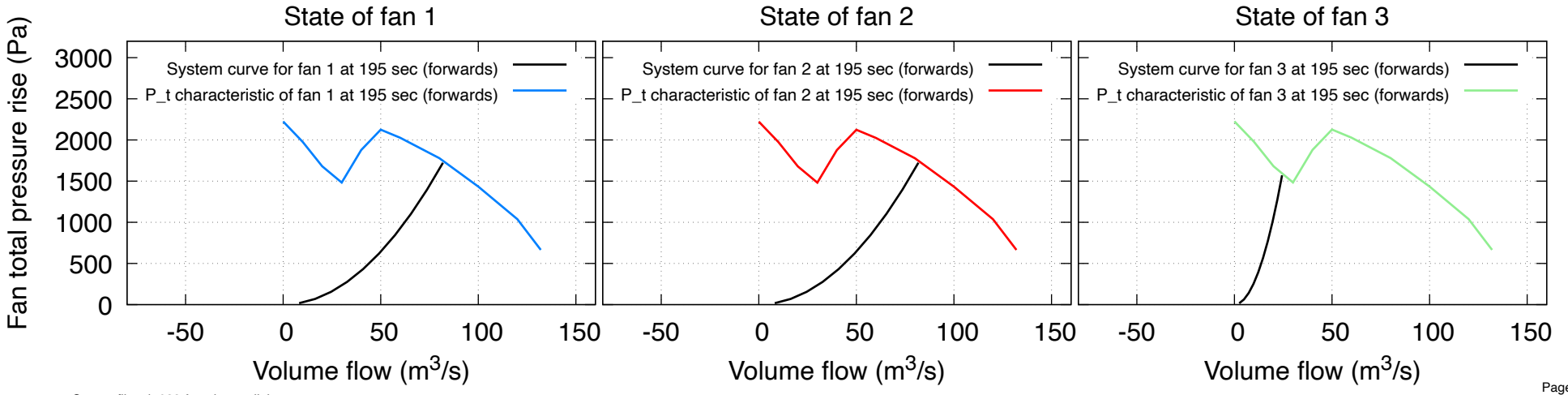

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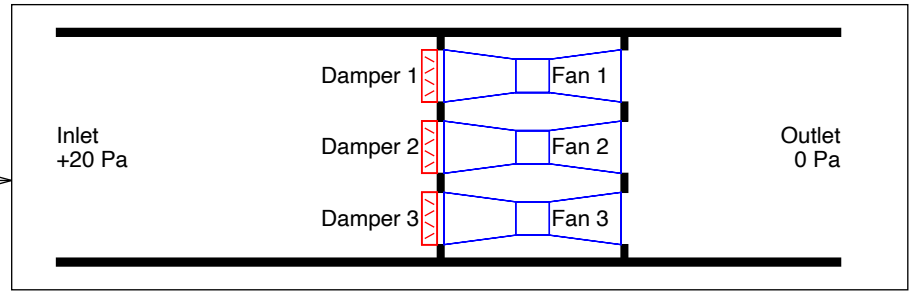

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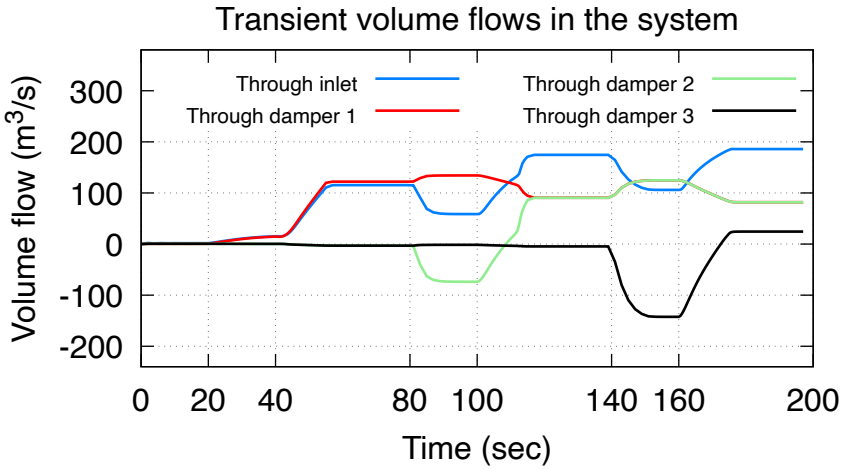

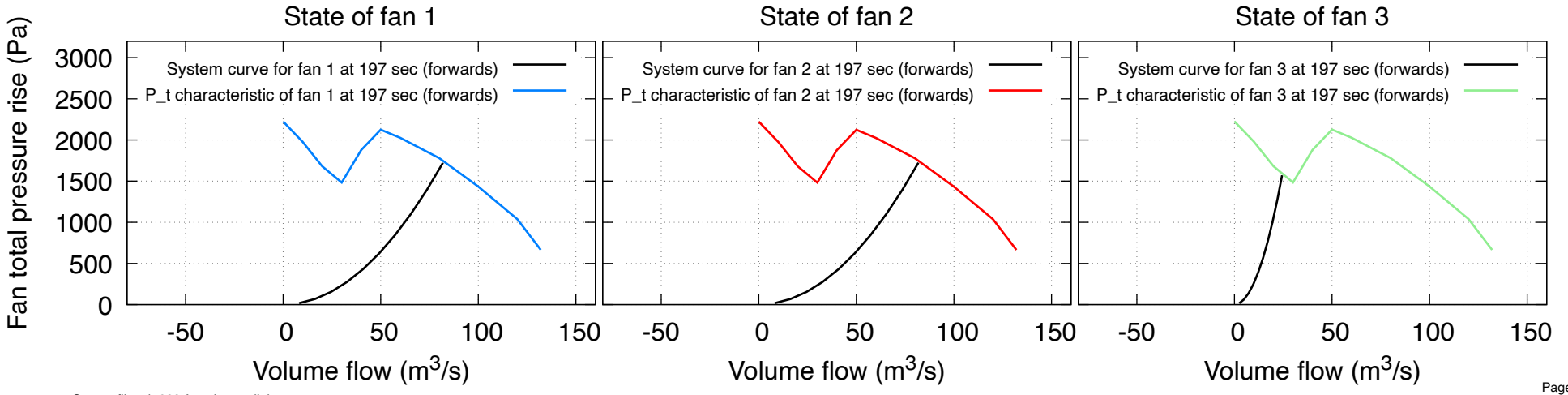

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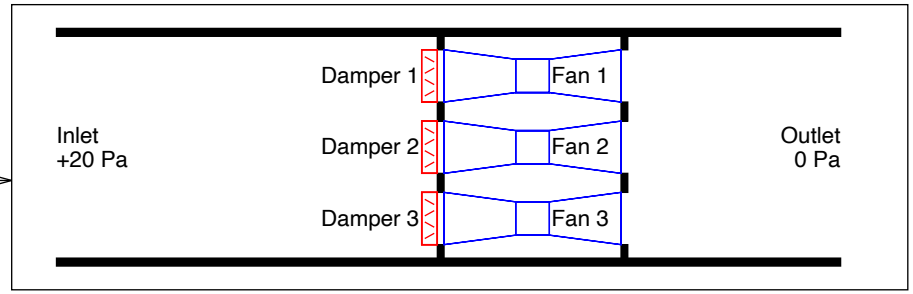

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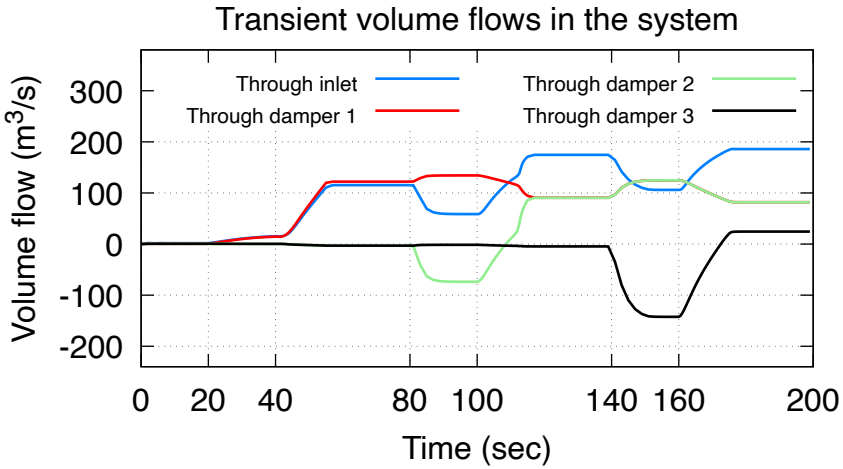
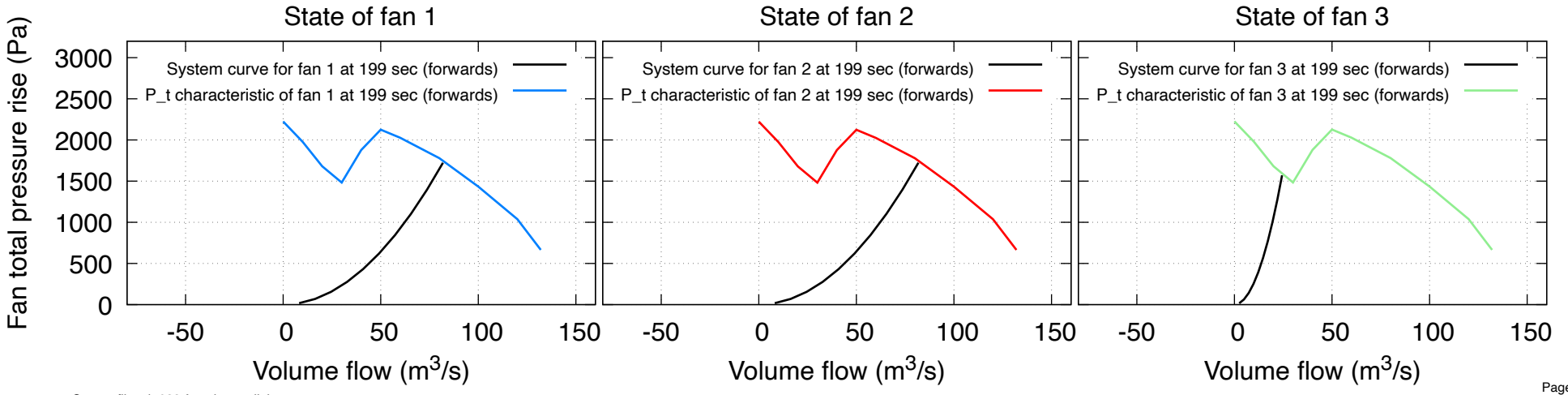
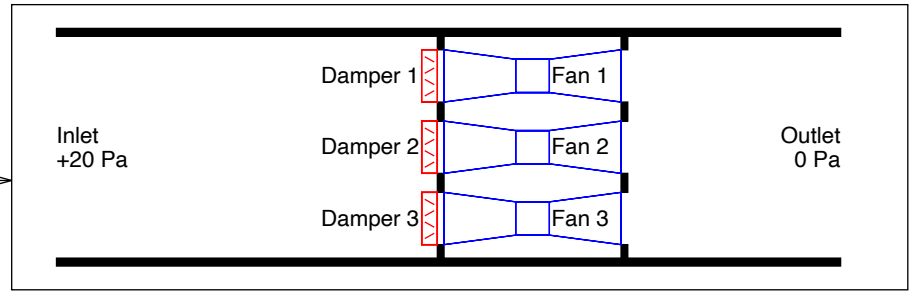
At 160 seconds, fan 3 starts





How not to run fans in parallel

This flipbook illustrates a problem that can occur when you try to run fans in parallel that are unsuitable for running in parallel.



Consider three identical fans with isolation dampers, in parallel:
The fans have a Q-P_{tot} characteristic with a bad stall hump.

The fans are started sequentially. Fans 1 and 2 get to suitable parts of their characteristics. Fan 3 can't get out of stall.

At 20 seconds, damper 1 opens

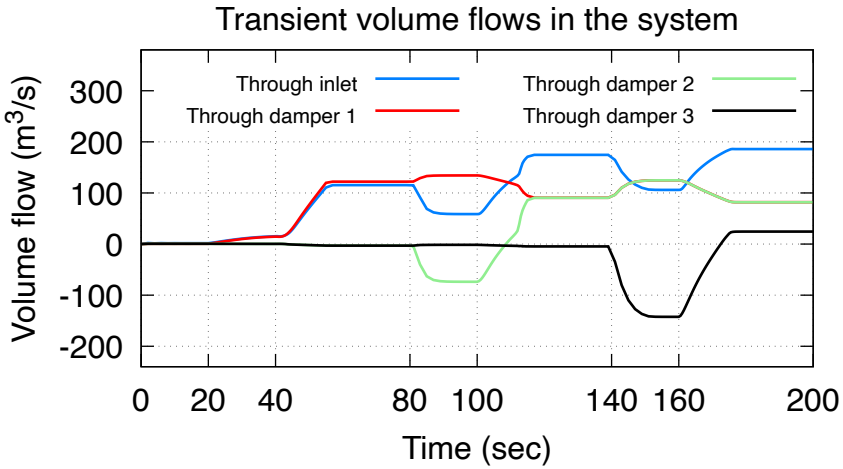
At 40 seconds, fan 1 starts

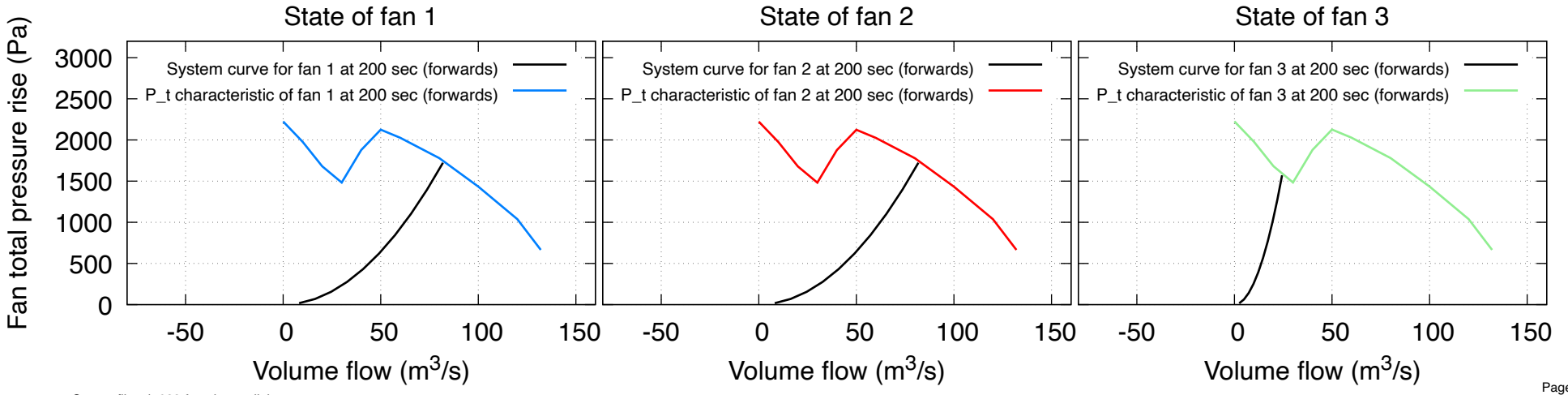
At 80 seconds, damper 2 opens

At 100 seconds, fan 2 starts

At 140 seconds, damper 3 opens

At 160 seconds, fan 3 starts





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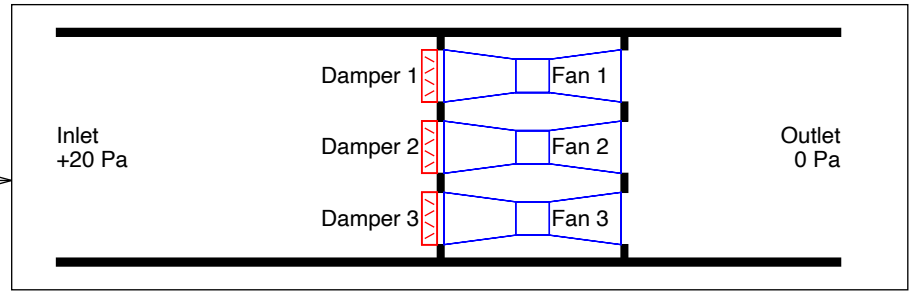

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