Training report M1 CSMI - BDR Thermea Group

Quentin Loeb

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Introduction

Context

- Main objective of the simulation team at BDR Thermea Group : enhance the performances of heatpumps
- Measures have to be done in cold rooms with specific conditions
- Some measure tools can be really expensive
- The supplier will deliver measures with the best precision

Generalities about DLLs

Objectives of the project

- The DLL can be coded in several different languages (Delphi, .NET, C...)
- Binary file working like a black box
- We can create wrappers to load them at the execution and call their functions
- We need precise documentation on how they work (delivered by the supplier)
- Only information we can get : function's name (dumpbin.exe tool)

DLL importation with wrappers

Two different methods

First method : Explicit Linking (windows.h package)

- Load the DLL with the function LoadLibraryA(char* path)
- Retrieve some functions with GetProcAdress(HMODULE dll_path, char* function_name)

⇒ More fastidious but better solution

Second method : Implicit Linking (Visual Studio)

- Link the DLL to a Visual Studio Project
- Requires the .dll and the .lib file
- Needs to build a second wrapper to call the projet

⇒ More simple importation but complex to import in Dymola

Dymola

Simulation of components

Objectives

- Create a function in Dymola to load our wrapper
- Create a model based on this function
- Simulate the model to validate the importation
- Create a generic model using Dymola's libraries for each component of the heatpump
- Calibrate the component with our wrapper (boundary conditions)

Dymola

Multi-variables return from C function

- Tables are complex to import in Dymola ⇒ We prefer to import separated values
- C language doesn't allow to return several variables at the end of a function
- Dymola can retrieve the value of pointers in the wrapper
- Good solution since the output will be independant

Dymola

Simulation of components

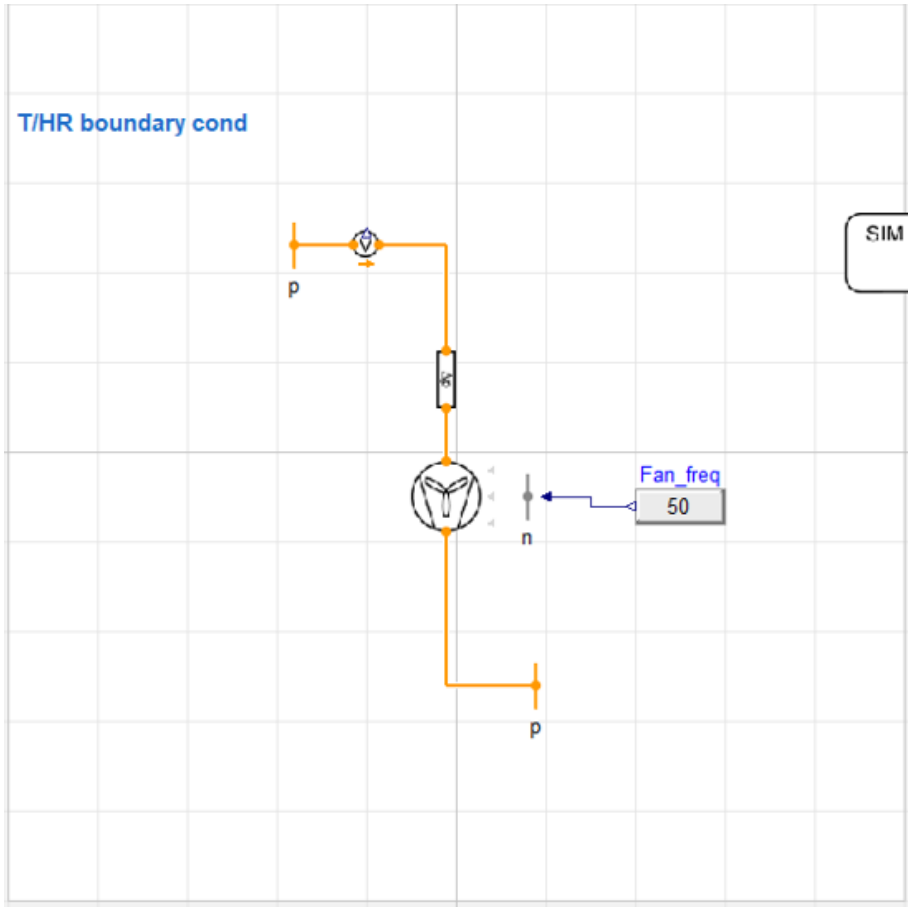

Figure – Model of fan made with Dymola's libraries

Dymola

Simulation of components

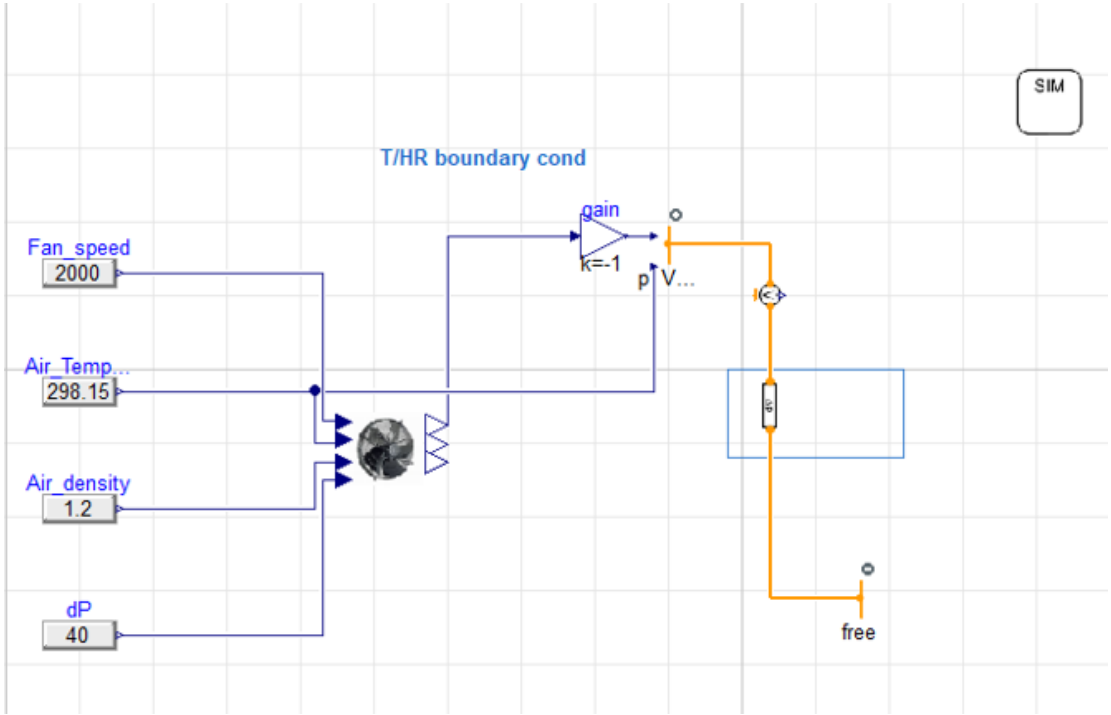

Figure – The same model with the DLL as boundary conditions

Dymola

Simulation of components

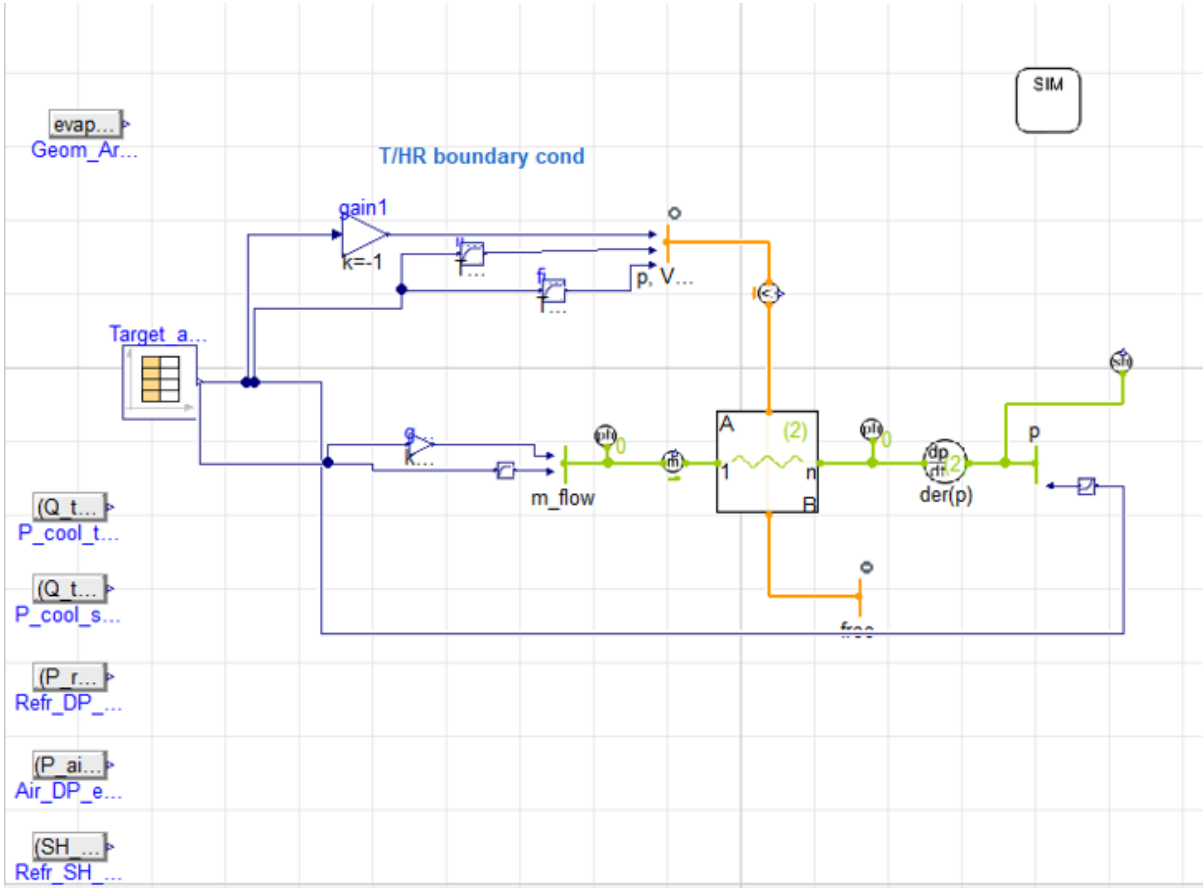

Figure – Model of fan and evaporator made with Dymola's libraries

Dymola

Simulation of components

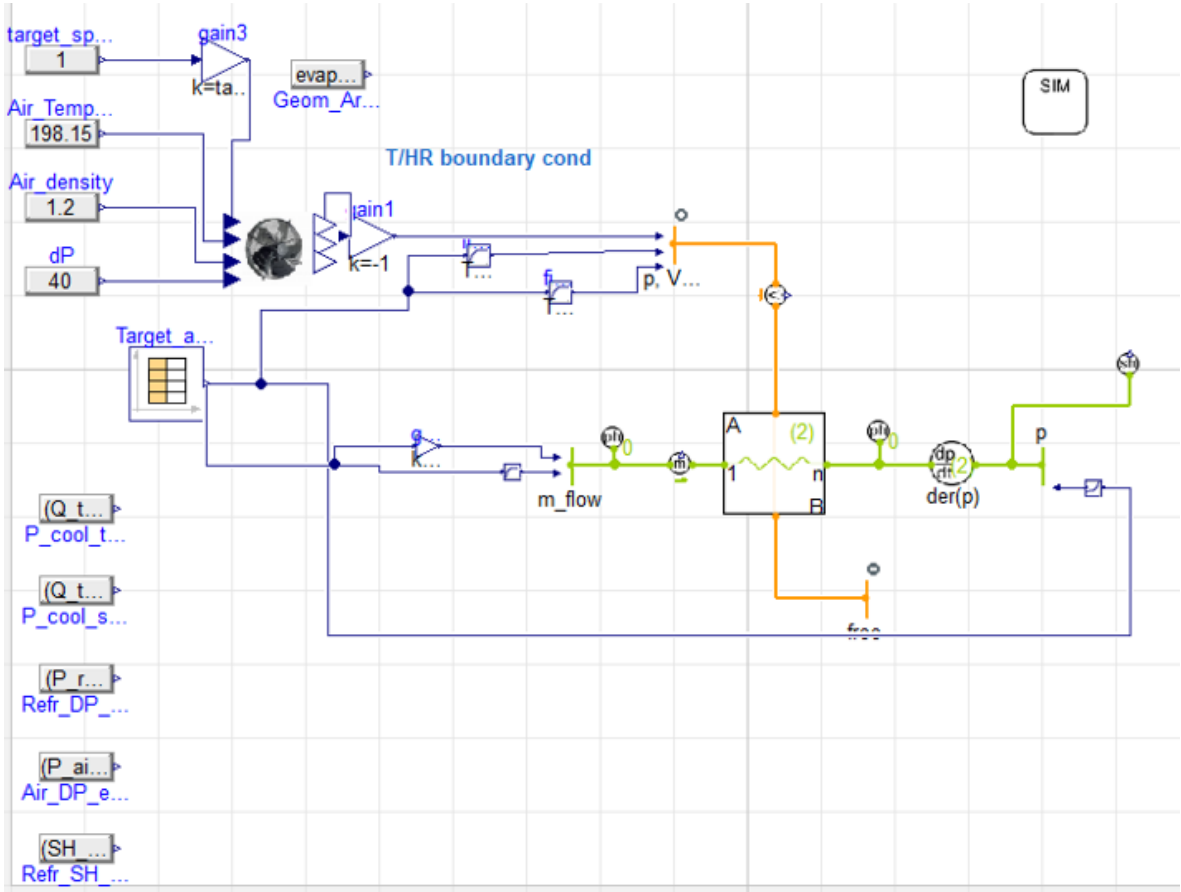

Figure – The same model with the DLL as boundary conditions

Conclusion

Difficulties encountered

- All the DLLs are not built the same way
- The compilation on Dymola seems to be computer-dependant
- Very few documentation on the topic

Benefits of the work

- Powerful tool for long-term development
- Much faster and cheaper way to simulate heatpumps
- The simulation's precision will highly increase