It is worth noting that one possible variant of the Approach C consists in defining the relationships between a *PhysicalComponentModel* and a *Tester component* in the *ESD* by using the construct *connect*, in order to avoid the exploitation of the *On* keyword during the definition of the tester components in the *TesterModel.* By adopting this version (similar to the A Approach), the *PhysicalSystemModel* will be completely decoupled from both the *RequirementModel* and the *TesterModel*.

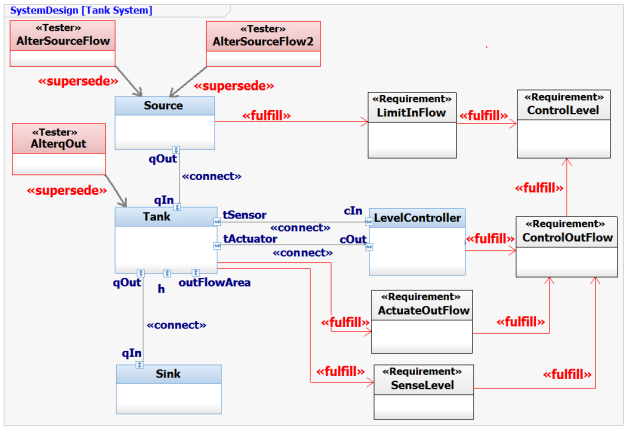

Figure 9. Approach C for modeling requirements of the Tank System.

5. Conclusions and future works

The paper focused on the modeling of requirements in an equation-based context. In particular, a reference *meta-model* for representing *System Requirements* in terms of *RequirementAssertions* has been defined. Then, three different approaches for the modeling of *System Requirements* that adhere to the proposed *meta-model*, have been outlined. All of them aim to provide support for model verification by defining extensions of the Modelica language, and, one of them also aim to extend such model verification by supporting the modeling of system failures and thus allowing to analyze the behavior of the system in presence of faults.

Finally, the exploitation of the proposed approaches in a case study concerning a Tank System has allowed to compare their advantages and disadvantages as well as to appreciate their effectiveness and usability in the system modeling phases.

This work is part of an ongoing research project (MODRIO project – ITEA 2) [10] aiming at developing a model-based approach for system requirements verification and fault tree analysis through Modelica extensions for Requirements modeling and Safety analysis.

Ongoing research efforts are devoted to improving the proposed approaches through both their implementation in *OpenModelica* [12] and their integration in a full-fledged Systems Engineering development process [5] along with an extensive experimentation in the analysis of systems in different application domains such as automotive, railway, avionics and energy.

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