Transient ignition modeling of gas leaks in enclosed modules

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Offshore oil platforms and onshore processing facilities often have enclosed process modules that handle flammable gases in high pressure segments. In arctic environments, enclosed modules will be more common due to the harsh weather which inhibits naturally ventilated modules. A detailed risk model will assist in ensuring safe design of such modules. In this work, we demonstrate a transient ignition model based on OpenFOAM. A CFD simulation of the transient leak is coupled with the gas detection system and the emergency shutdown system. Upon gas detection the emergency shutdown system will be initiated which is modeled by modifying the leak rate. The transient gas cloud development is then coupled with an ignition model which accounts for discrete ignition sources within the geometry and continuous ignition sources. Results will be presented for a realistic module geometry, see Figure 1. An example of flammable gas development and the total ignition probability development as a function of time is shown in Figure 2.

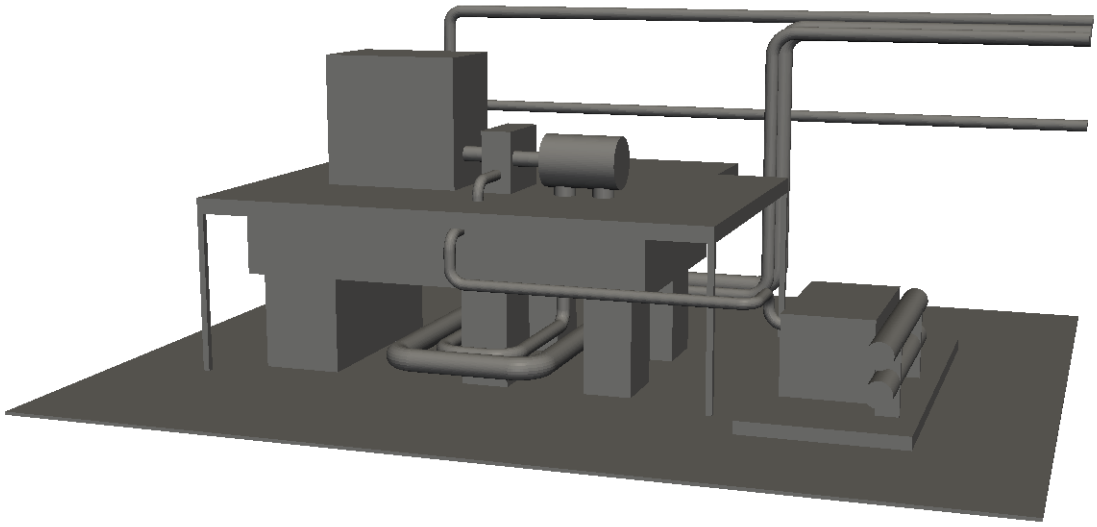

Figure 1: Enclosed process module geometry.

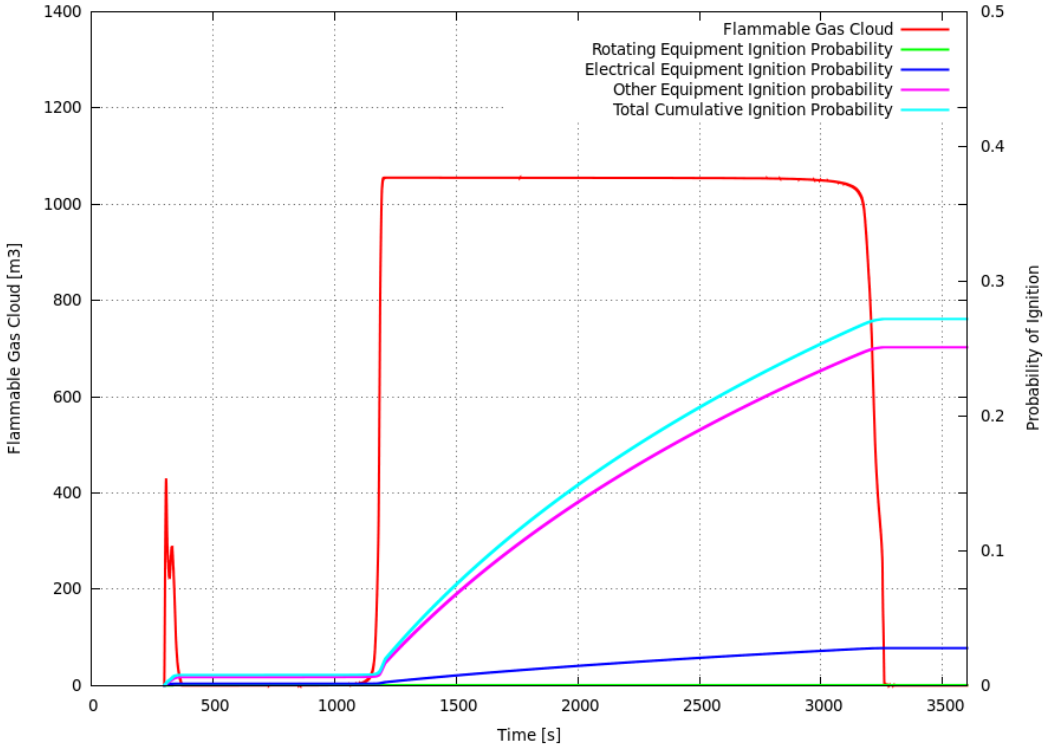

Figure 2: Transient gas cloud and ignition probability.