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PROCESSING TUBE FURNACE TEST DATA AND IMPROVING THE DATA REDUCTION ALGORITHMS FOR UCFIRE

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Abstract. *UCFire is an application for storing and reducing fire test data in a useful manner for fire engineering analysis. Three tasks have been identified to enhance UCFire's functiona*

collected from cone calorimeter tests and furniture calorimeter tests [3], in order to compute the gas species yield over the burning duration. Equation (1) [4] is adopted in UCFire to compute the gas species yields of a combustion process. is the mass yield of gas species *i*,

4.1 Test data used for analysis of Task 1

Three sets of test data are used for investigating the modifications in Task 1, as elaborated below. AS/NZS 3837:1998 [6] and NT Fire 032 [8] are used as the reference test standards for cone calorimeter tests and furniture calorimeter tests respectively.

Cone calorimeter test data used by Tobeck [

Options (b) and (c) are user-defined MLR cut-off points not based on any percentile criterion. For option (b), the base area of the burning object is usually fixed in cone calorimeter tests, but is highly variable across different furniture calorimeter tests. Although this option works well for the size of the object given in Furniture Test 1, this option has not been validated for other sizes of burning objects, and therefore, not recommended for furniture calorimeter test data at this point. Option (b) also works for cone calorimeter tests, but its MLR cut-off value is higher than that determined using option (c), suggesting that more test data is preserved when option (c) is applied to cone calorimeter test data compared to option (b).

4.5 Recommendation for Task 1

Option (c) seems to be the most feasible option to adopt for UCFire. Applying option (c) to obtain gas species yield will not only achieve reasonable gas species yield curves for both cone calorimeter and furniture calorimeter test data, there should also be better consistency in the computed gas species yield results, as these tests will have to adhere to the load cell accuracy requirements stipulated in the respective test standards. MLR algorithm.

5 ENABLE UCFIRE TO PROCESS TUBE FURNACE TEST DATA TASK 2

5.1 Standard test report requirements

The standard test report requirements for tube furnace tests are obtained from *ISO/TS 19700: Controlled equivalence ratio method for the determination of hazardous components of fire effluents* [7]. These requirements are compared against existing data storage fields in UCFire. The following lists the data fields which are already available in UCFire, and those that are unavailable.

Required data fields that are already available in UCFire include:

- Name and address of testing laboratory;
- Test Identity Number (ID) and test date;
- Test operator;
- Laboratory ambient temperature and humidity;
- Details of test specimen preparation, configuration and conditioning;
- Burning behaviour;
- Mean concentration of each gas species (computed over steady state duration);
- The methods used to determine effluent yields;
- Mandatory test statement;
- Observations and difficulties experienced during testing.

Required data fields that were unavailable in UCFire, and need to be created in UCFire XML schema:

- Decomposition conditions;
- Run temperature;
- Primary and secondary air flow rate;
- Sample drive speed;
- Mass-charge concentration;
- Mass-loss concentration;
- Mean yield of each gas species (computed over steady state duration);
- Mean smoke extinction coefficient (computed over steady state duration);
- Smoke specific extinction area (computed over steady state duration).

Figure 3: Dialog box to allow user to key in steady state start time and end time.

6 ENABLE AUTOMATIC COMPUTATION OF HEAT RELEASE RATE FOR CONE CALORIMETER TEST DATA TASK 3

To allow UCFire to automatically compute HRR data, , for cone calorimeter tests, Equations (6), (7) and (8) [6] are added into UCFire to compute the HRR values for each scan.

Figure 4: Comparison of heat release rate curves.

7 CONCLUSION

All three tasks were successfully completed, enhancing the data storage and data reduction functionality of UCFire. A reasonable MLR cut-off based on accuracy level of measurement load cells is adopted in UCFire. UCFire is also able to store and process tube furnace test data, and compute HRR data for cone calorimeter tests automatically.

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