

Development of Methods and Models to Characterize Emissions and Estimate Indoor Exposure from Spray Polyurethane Foam (SPF) Insulation

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Purposes

- Update EPA's research on SPF insulation test method development approach
- Collect contact information of potential model testers for OPPT's new model "Simulation program for estimating chemical emissions from sources and related changes to Indoor Environmental Quality in buildings with Conditioned and Unconditioned zones (IEQ-CU)"

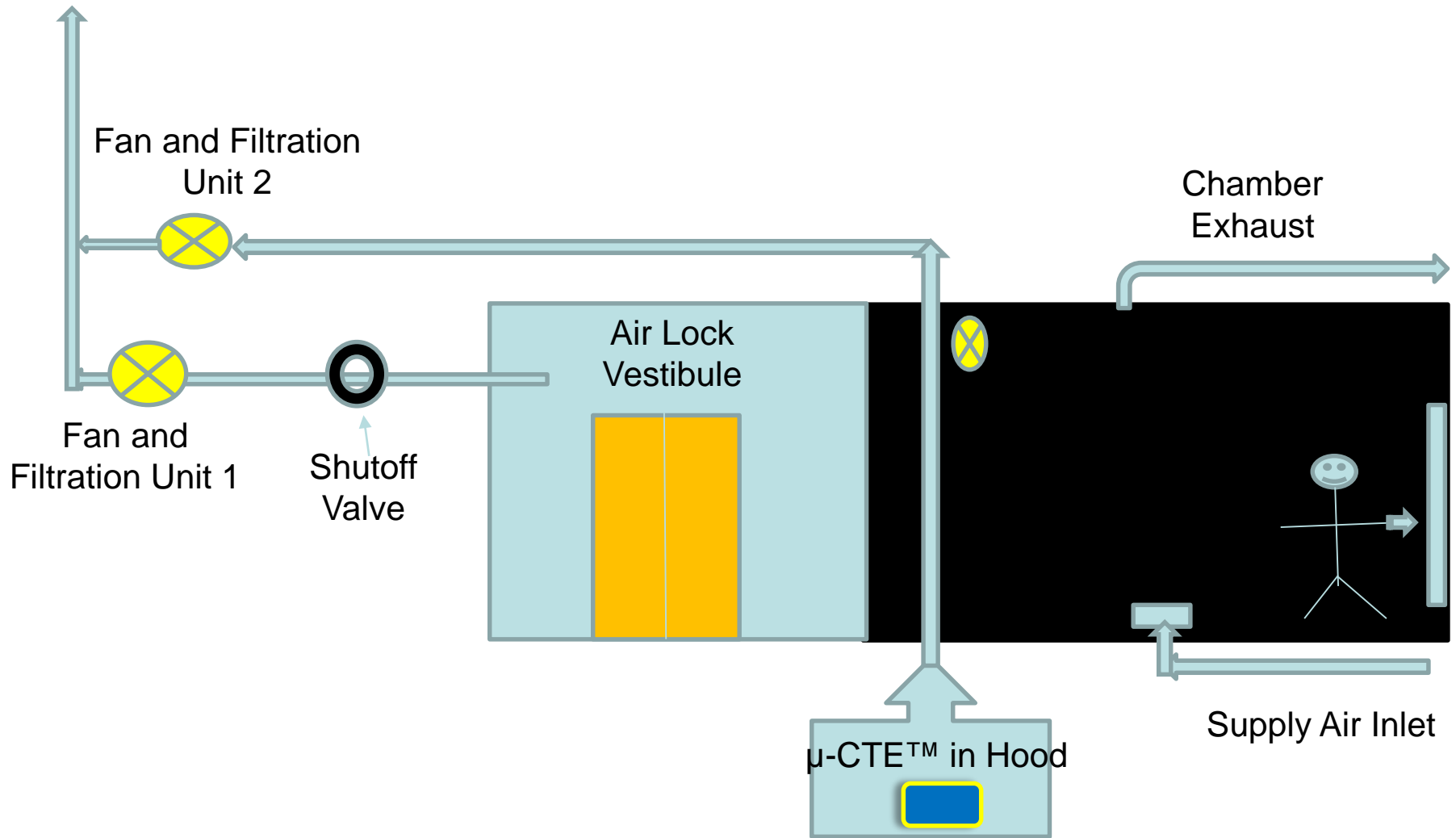
Background

- SPF insulation is manufactured on-site from chemicals with known health hazards
- EPA and other federal agencies are concerned with worker and consumer exposures to these products
- Relationships between product application, curing, post-application emissions, exposures, health and environmental outcomes are poorly understood
- EPA's research goal: develop and demonstrate consensus methods, data, and models to inform exposure assessments and strategies to minimize exposures

ORD Full-scale SPF Insulation Emissions Characterization Objectives

- Improve understanding of methods suitable for characterization of application and post application phase emissions
 - Comparability between “wet” and “dry” sampling approaches for fast-reacting isocyanates
 - Gas-particle distribution of FRs during application
 - Deposition of FRs on surfaces (wipe samples)
 - Blowing agent, amine catalyst, VOCs
- Generate data and methods to inform development of ASTM full-scale SPF emissions test protocols (WK51588)

Modified 30 m³ Emissions Test Chamber

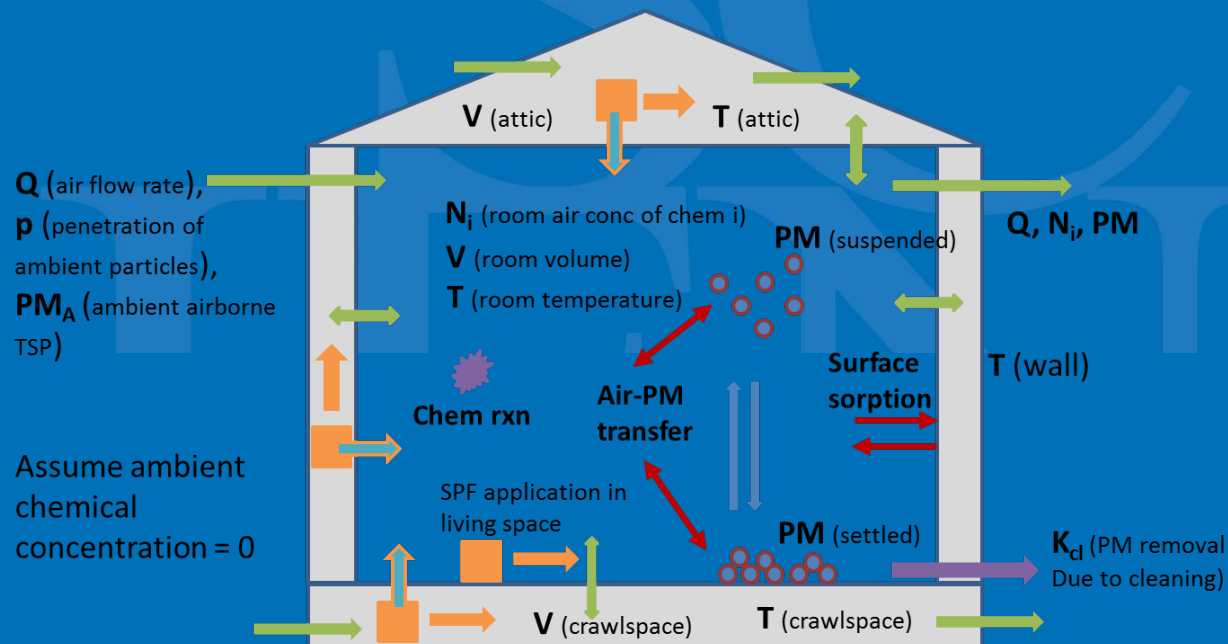


μ-CTE™ - Micro-Chamber/Thermal Extractor™

OPPT Model Development

- Simulation program for estimating chemical emissions from sources and related changes to Indoor Environmental Quality in buildings with Conditioned and Unconditioned zones (IEQ-CU)
 - Characterize emissions and exposures from SPF
 - A general-purpose tool for the multi-zone semi-volatile organic compounds (SVOCs) model
- Scope
 - Covers both short - and long - term emissions
 - Conditioned and unconditioned zones
 - Allows temperature - dependent input parameters
 - Additional future - chemical reactions in gas-phase, QSAR (quantitative structure–activity relationship) models for parameter estimation, particles, built-in and user-defined scenarios/cases

Conceptual Framework for SPF Model



- Source (SPF)
- Emission from source to air
- Emission from source and diffusion through material
- Air flow between zones (attic, wall cavity, crawlspace & living space)
- Air flow between zones and outdoors
- Chemical in air phase
- Particles
- Chemical sorbed to particles

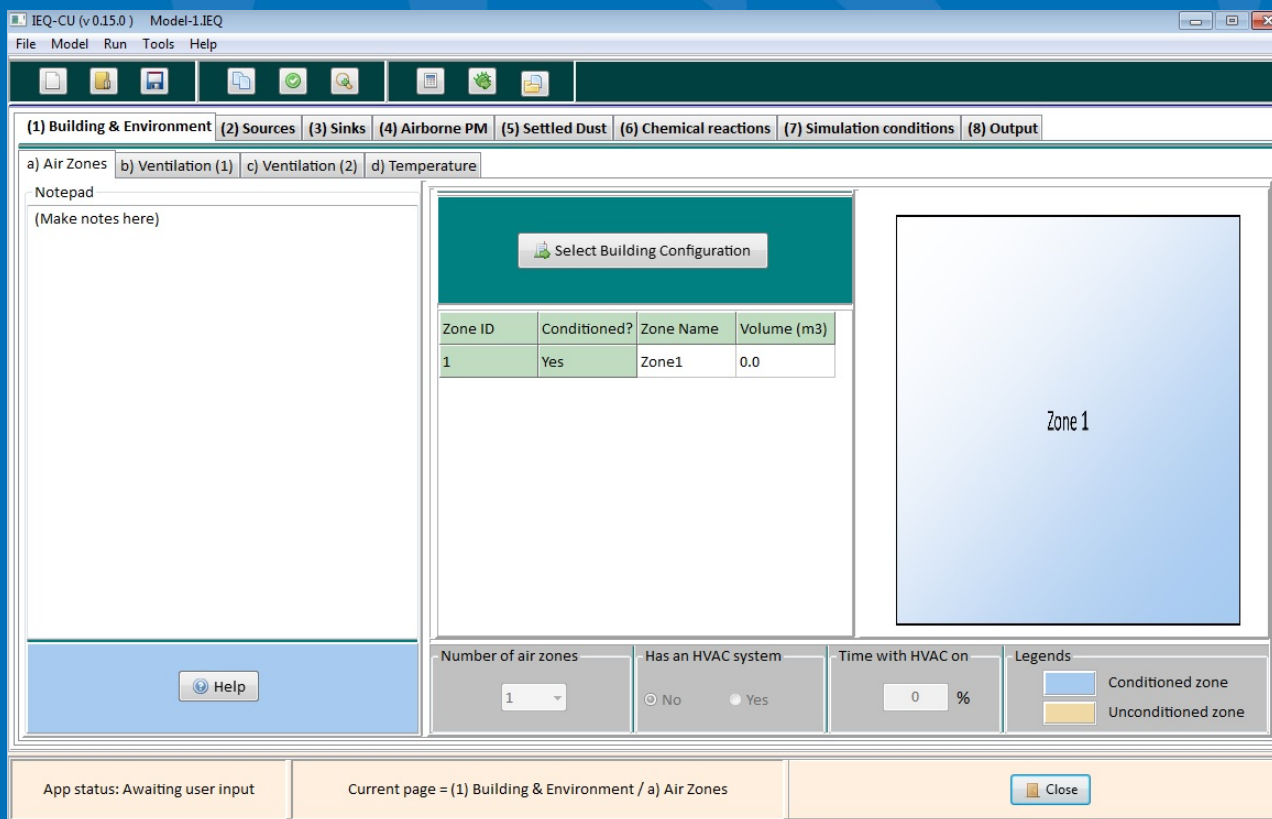
Not shown:

Air handling system,
Source (SPF) in air duct,
Variable ventilation rate
source zone,
Air filtration devices.

Chem rxn – chemical reaction; TSP – total suspended particulates

Software Design - GUI

- The graphic user interface (GUI) is similar to those of Indoor Air Quality and Inhalation Exposure (IAQX) and Indoor Semi-volatile Organic Compound (i-SVOC) programs



IEQ-CU Development

➤ Target users for IEQ-CU

- Risk assessors, risk managers, product manufacturers, material specifiers, indoor environment researchers, consultants, and educators

➤ Next Steps

- EPA/OPPT posts model for evaluation by user community
 - Expected summer 2016
- EPA/ORD generates micro chamber and full-scale SPF insulation emissions data for model evaluation
 - Expected summer/fall 2016

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